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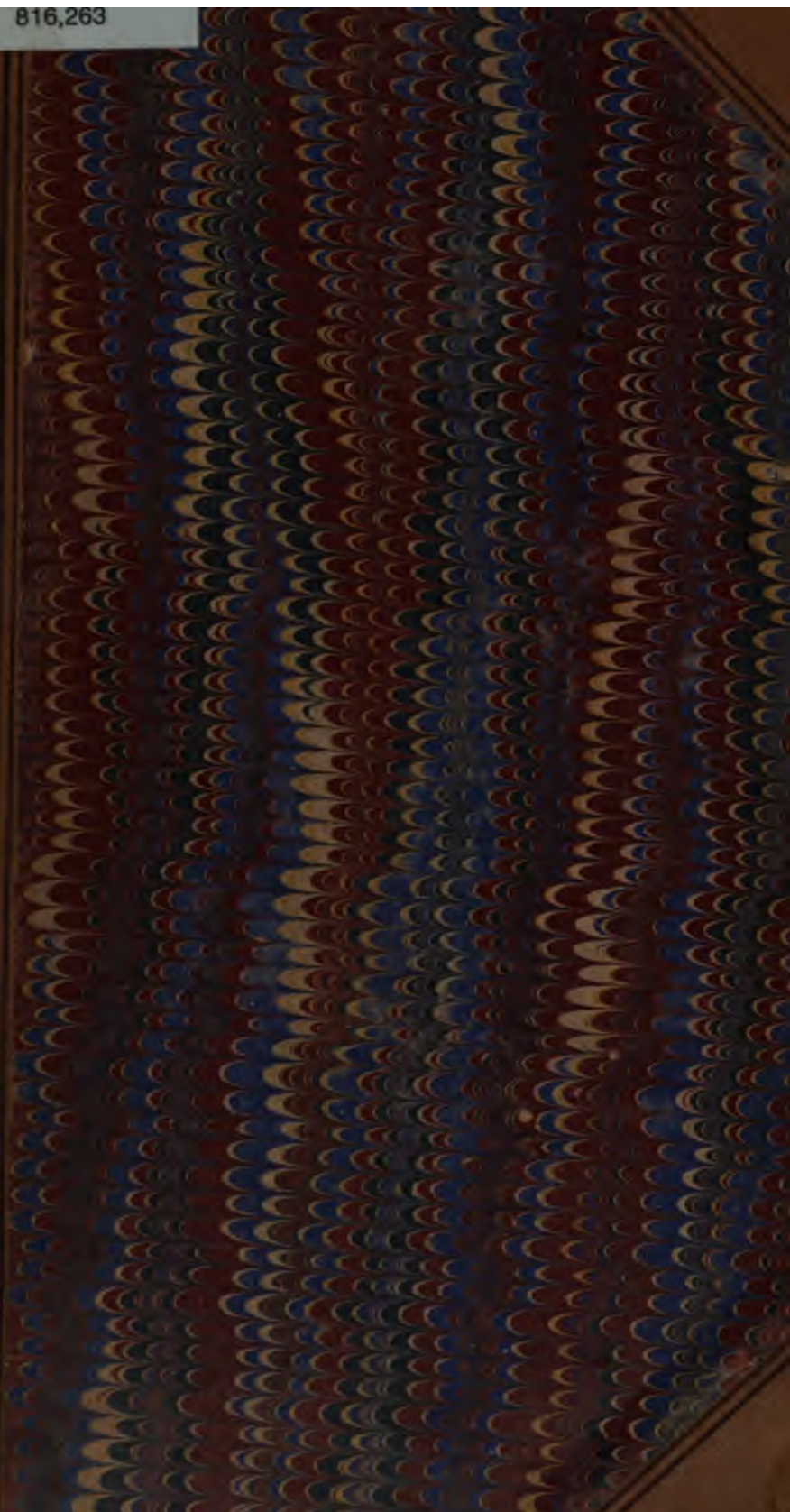
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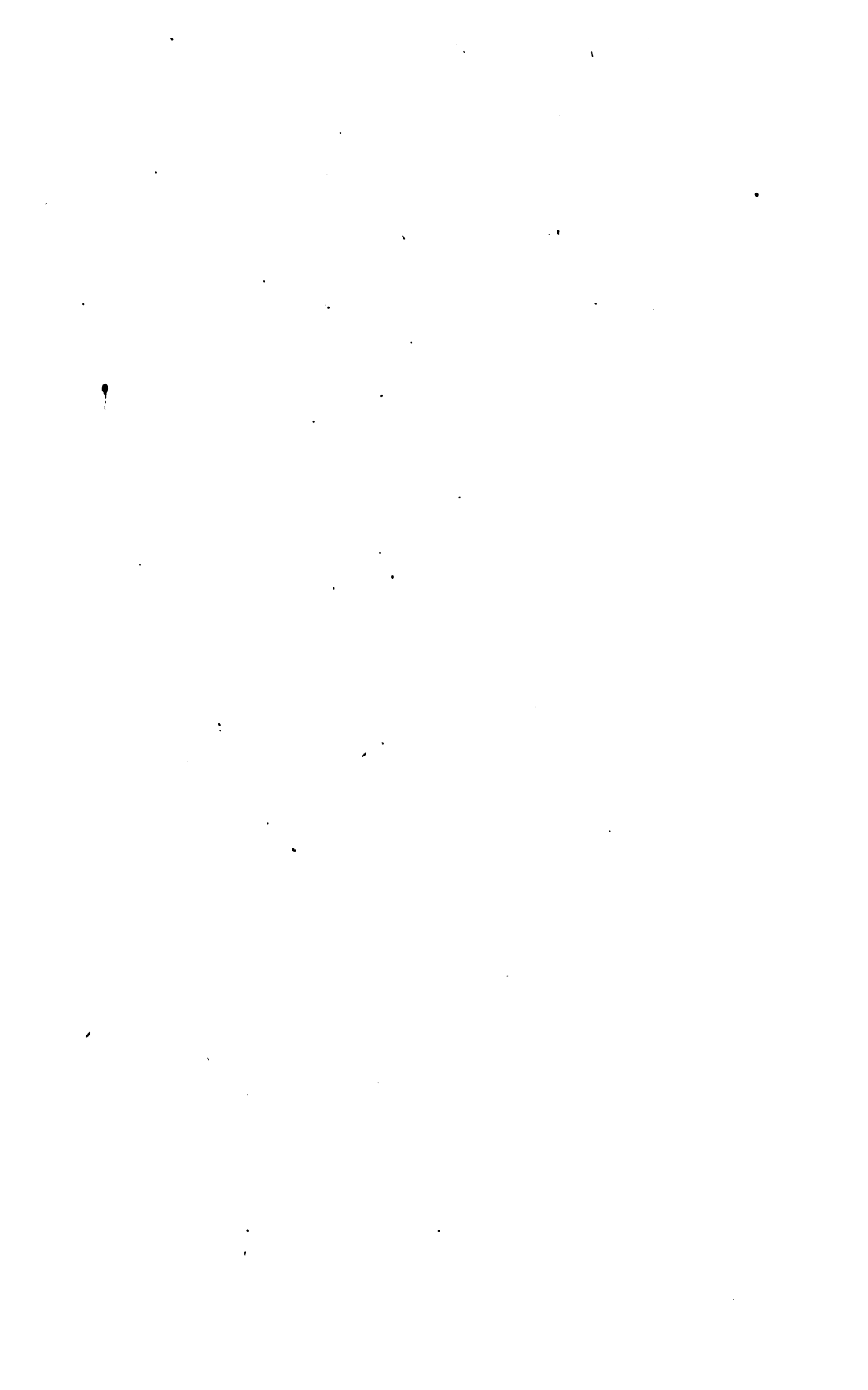


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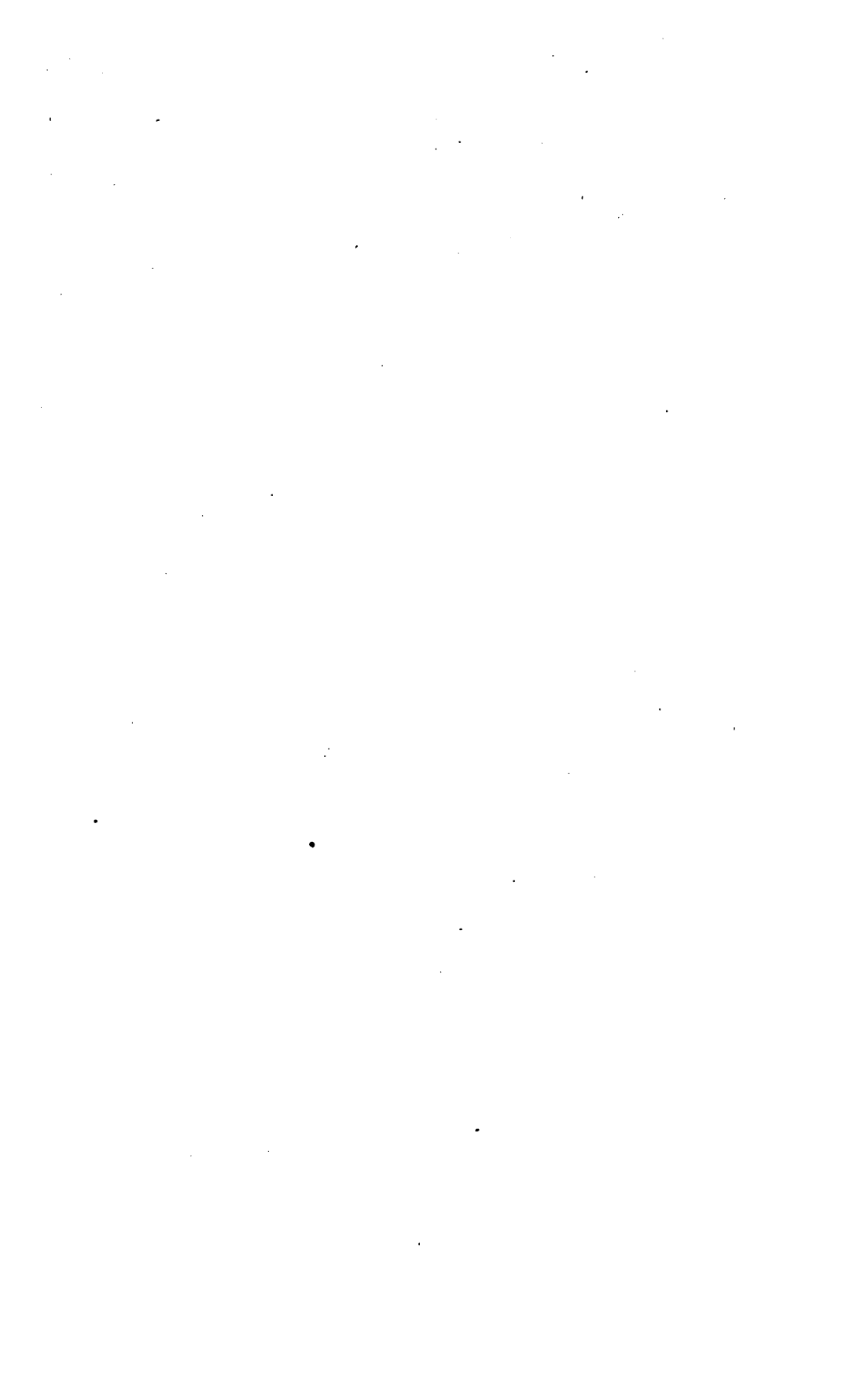












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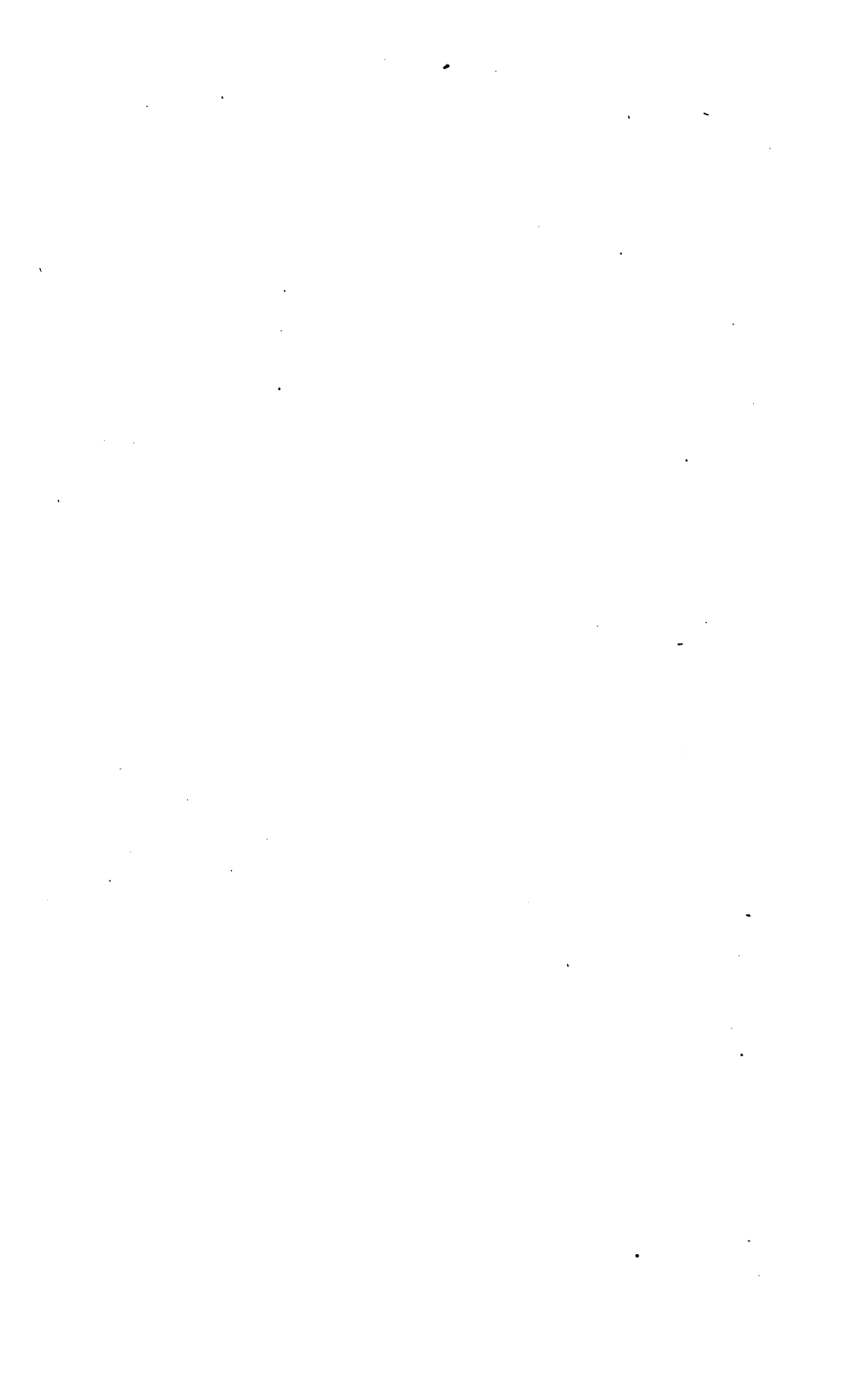
SECRETARY OF THE NAVY.

1889.

IN TWO PARTS.

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# REPORT OF THE SECRETARY OF THE NAVY.

NAVY DEPARTMENT,  
November 30, 1889.

*To the President:*

The effective force of the United States Navy, when all the ships now authorized are completed, excluding those which by the process of decay and the operation of law will by that date have been condemned, will comprise 11 armored vessels, of which only three are battle-ships, and 31 unarmored vessels, making a total of 42.

The following statement shows the number of war vessels on the effective list of the principal foreign powers, built, building, or projected, at the present time, and exclusive of sailing and practice ships:

Country.	Armored.	Unarmored.	Total.
England.....	76	291	367
France.....	57	203	260
Russia.....	49	119	168
Germany.....	40	65	105
Holland.....	24	70	94
Spain.....	12	78	90
Italy.....	19	67	86
Turkey.....	15	66	81
China.....	7	66	73
Sweden and Norway.....	20	44	64
Austria.....	12	44	56

The table shows that even when the present building program is completed, the United States can not take rank as a naval power.

The purpose for which the United States maintains a navy is not conquest, but defense. For reasons of economy and public policy, the force should be as small as is consistent with this object. But it appears from the above comparison, that with all the additions authorized by the legislation of the last seven years, the country, as far as its capacity for defense is concerned, will be absolutely at the mercy of states having less than one-tenth of its population, one-thirtieth of its wealth, and one-hundredth of its area. While the element of defensive strength is thus clearly deficient, the vulnerable points open to an

enemy's attack, and the interests liable at all times to injury, are numerous and important. A coast line of 13,000 miles upon which are situated more than twenty great centers of population, wealth, and commercial activity, wholly unprotected against modern weapons, affords an inviting object of attack, with a wide range of choice as to the points to be selected. Any one of the powers named could, without serious difficulty, even after the completion of our fleet as now authorized, secure in a single raid upon our coast, an amount of money sufficient to meet the expenses of a naval war; an amount, one-half of which, if judiciously expended over a series of years, would be sufficient to afford this country a guaranty of perpetual peace.

The defense of the United States absolutely requires the creation of a fighting force. So far the increase has been mainly in the direction of unarmored cruisers. These vessels, while useful in deterring commercial states from aggression and as an auxiliary to secure celerity and efficiency in larger operations, do not constitute a fighting force, even when it is intended exclusively for defense. To meet the attack of ironclads, ironclads are indispensable. To carry on even a defensive war with any hope of success we must have armored battle-ships. The capture or destruction of two or three dozen or two or three score of merchant vessels is not going to prevent a fleet of ironclads from shelling our cities or exacting as the price of exemption a contribution that would pay for their lost merchantmen ten times over. We must do more than this. We must have the force to raise blockades, which are almost as disastrous to commercial cities as bombardment. We must have a fleet of battle-ships that will beat off the enemy's fleet on its approach, for it is not to be tolerated that the United States, with its population, its revenue, and its trade, is to submit to attack upon the threshold of its harbors. Finally, we must be able to divert an enemy's force from our coast by threatening his own, for a war, though defensive in principle, may be conducted most effectively by being offensive in its operations.

If the country is to have a navy at all, it should have one that is sufficient for the complete and ample protection of its coast in time of war. If we are to stop short of this, we might better stop where we are, and abandon all claim to influence and control upon the sea. It is idle to spend our money in building small, slow-going steamers, that are unnecessary in peace and useless for war. It is little better than a repetition of the mistaken policy that prevailed in our early history, of building gunboats that were laid up or sold as soon as war broke out. The country needs a navy that will exempt it from war, but the only navy that will accomplish this is a navy that can wage war.

The policy of military aggrandizement is totally repugnant to American institutions, and is not likely ever to be entered upon. The present question has nothing to do with such a policy. It is a practical business question of insuring our property and our trade, in which the commercial cities of the coast, the ports on our lake frontier, and the centers of production in the interior are alike interested. The naval force before

the war, when the population numbered thirty millions, included ninety vessels of all classes. Before the completion of the present program, which will give a total of less than half that number, the population will have more than doubled, and the wealth on our coast subject to injury or destruction will have increased tenfold. The annual increase of wealth in this country is estimated to equal that of England, France, and Germany, and before it can create an effective navy its population is certain to exceed that of any two of these powers combined. Such a nation can not be indifferent to events taking place in close proximity to its own coasts, threatening the freedom of its commerce and the security of its sea-port cities. The questions that have arisen and that will continue to arise in the Gulf of Mexico and the Pacific concern the prosperity and development of the United States too closely to be further ignored, and our interests in these localities are too important to be left longer unprotected.

The cost of building a navy casts no perceptible burden upon a country of our vast resources. It is the premium paid by the United States for the insurance of its acquired wealth and its growing industries. Compared with the interests that are secured, the rate is low. It is a cheap price to pay for safety. We collect in duties in six months at a single port a greater sum than we could spend in building a new navy in six years. For the past two years the Government has paid its creditors for the privilege of discounting its debt before it was due twice the sum we have spent in reconstruction. And the fact must be remembered that of the amount which we spend for the construction of a ship, only a small fraction, perhaps one-tenth, goes for absolutely raw material, while the remaining nine-tenths represents, in one form or another, the earnings of American labor.

It is sometimes asserted that there need be no haste about building ships, upon the supposition that our reserve strength is sufficient to improvise a force in time of war. This is a fatal mistake. Naval wars in the future will be short and sharp. It is morally certain that they will be fought out to the end with the force available at the beginning. The nation that is ready to strike the first blow will gain an advantage which its antagonist can never offset, and inflict an injury from which he can never recover.

Under the most favorable circumstances, with the largest experience and the best mechanical appliances, the construction of war-ships takes a long time. In the United States much has been learned in the last eight years, and facilities have been greatly enlarged, but much still remains to be done, and a longer time is required here than in the ship-yards of Europe. The design and construction of the innumerable and complex details of a modern war-ship can not be hurried. There is no branch of mechanical art in which haste leads more certainly to wastefulness and imperfection. The limited capacity of our establishments, public and private, is a further cause of delay. If Congress were ready to-day to authorize the construction of all the ships that we need

it would be a mechanical impossibility for the country, with its present appliances, to furnish them within fifteen years; while the first six months of hostilities would not only see our exposed cities forced to submit to heavy contributions, but every ship-yard in the country, public or private, destroyed, and thus the last hope extinguished of creating a navy to meet the emergency of war.

#### THE NEW CRUISERS.

The new cruisers are eight in number, the *Chicago*, *Boston*, *Atlanta*, and *Dolphin*, contracted for in 1883, and the *Baltimore*, *Charleston*, *Yorktown*, and *Petrel*, contracted for in 1886 and 1887.

In looking back at the work of naval reconstruction, begun seven years ago, the country has reason to be congratulated on the success of the undertaking. The building of the first four ships was an experiment in a field hitherto untried in this country, but they have fully sustained the high reputation of American mechanics. In 1882, when these cruisers were designed, the Department was wholly without experience in the construction of modern war vessels. Nothing of the kind had been undertaken since 1874, and but little then. Boards and bureaus were without precise information as to progress abroad, and without the means of acquiring it.

Notwithstanding these difficulties, the results accomplished by the earliest cruisers compared favorably with those obtained by foreign ship-builders. In 1882 there were but eight war vessels in existence of less than 5,000 tons which were capable of making 16 knots. Our three earliest cruisers developed a mean speed of between 15 and 16 knots—the *Chicago*, 15.33; the *Atlanta*, 15.54, and the *Boston*, 15.58. The *Atlanta's* highest average for one hour was 16 knots, and the *Chicago's* 16.35, while the *Boston*, in her best run over the measured mile, on September 21, 1889, made 16.33. These figures put an end, fully and finally, to all controversies over the speed of the vessels. The *Boston* and *Atlanta* have made cruises, and their performance at sea shows that they are thoroughly stanch and seaworthy vessels in all weathers, and although it is possible that the world may have contained, at the time they were designed, a very few swifter cruisers, their high efficiency can no longer be called in question.

The record of the *Dolphin*, which vessel began with a speed of 15.11 knots on her contract trial, and which has recently returned from a cruise around the world, is not less satisfactory. The results of the inspection of the vessel, after she has been three years and nine months in commission, are reported by the Board of Inspection, under date of October 2, 1889, as follows:

The material used in the construction of this vessel, and the workmanship, speak well for the designers and the builders. Aside from the slight repairs to her bearings she is ready for another cruise. By the most liberal estimates the work in the construction department can be done inside of a month. This, the first of the new Navy, makes a splendid showing for structural strength, fine material, and good care.

Her captain reports that she can average 14 knots an hour for any length of time, and under favorable circumstances she can run 16 at sea.

In the course of her cruise the *Dolphin* has run 58,000 miles in twenty months, and has been under steam 9,000 hours. In this prolonged run she has been stopped for repairs but once, and then for only two hours. This performance is probably without a parallel in the history of naval vessels, and bears conclusive testimony to the high skill of American artisans and the excellence of their work. Nor is it the less remarkable, in view of the confident predictions with which, at the outset of her career, the official condemnation of the vessel was somewhat prematurely pronounced by expert and by inexperienced judges.

It is therefore proved by the test of actual cruising that these first modern experiments of the Department have come close to the highest standard of speed which had been reached at the date of their design, and that in structural strength, endurance, and workmanship they are not inferior to anything now afloat.

In view of these facts, the extraordinary statement, put forth in the Secretary's report for 1886 and never afterwards corrected, that a comparison of these vessels with the *Esmeralda* and other foreign ships indicates "a simple abandonment on the part of the Department of any attempt to reach the conditions which should have been attained," must be set down as a mere flight of political rhetoric, absolutely without warrant or justification. If the Department requires any vindication from such a charge, its complete vindication is to be found in the vessels themselves.

At the very time when the first cruisers were being designed the Department took steps to supply its want of experience by the systematic acquisition of information as to naval progress abroad. The establishment of the Office of Naval Intelligence and the assignment of naval attachés to duty in Europe, both of which measures date from 1882, have been of incalculable assistance in the work of reconstruction; and it is proper to refer especially to the untiring and successful efforts of Commander F. E. Chadwick, the first attaché sent out, whose extraordinary ability and judgment during six years of difficult service in England and on the Continent have had a lasting influence upon naval development in this country. The results subsequently obtained have shown the wisdom of the policy adopted at the outset.

The importance of a knowledge of progress abroad was increased by the rapid strides which it made during this period. In 1882 the compound engine was the highest development of marine engineering in practice. The first successful example of the triple-expansion engine, that of the steam-ship *Aberdeen*, was designed about this time. Little progress was made in its application until 1884, and not until 1885 did its use become general, even in the merchant service. In that year the keels were laid of the first ships of war provided with triple-expansion engines. These were the English belted cruisers of the *Orlando* class, in which the new type of engine was substituted at the last moment, after tenders had been invited and awards made for the old or compound type.

Of this extraordinary development in ship and engine construction,

by which, between 1882 and 1885, the art was almost revolutionized, the attainment of high speed made practicable, and the STANDARD ADVANCED FROM 16 TO 20 KNOTS, the Department was thus able to reap the full benefit. The measures which had been previously taken kept it fully informed of the progress of naval science in Europe, while the completion of the experimental cruisers of 1882 enabled our constructors to study the practical application of the problem as they had never studied it before. Of the new cruisers which were started about this time, the designs of two, the *Baltimore* and the *Charleston*, came from abroad. They were provided with the latest foreign appliances, with the exception of the *Charleston*, whose engines, built from plans purchased in the latter part of 1885, were of the compound type. All the other vessels had triple-expansion engines.

Of these cruisers four have undergone their official trial—the *Baltimore*, *Charleston*, *Yorktown*, and *Petrel*.

The *Baltimore*, of 4,400 tons, showed at her first trial 8,977.88 horse-power, 19.57 knots average speed for four hours, and 20.2 knots speed during the best hour of the four. The horse-power marking a slight deficiency (22.12) below the contract requirement, the contractor, at his own request, was given another trial. The Department is glad to report that this trial has proved a brilliant success, the horse-power being somewhat in excess of the contract requirement, the average speed for four hours being 20.1, and the highest speed for one hour being 20.39. This result is unparalleled by any war ship of the *Baltimore's* displacement in the world.

In all respects the *Baltimore* has proved thoroughly satisfactory. An undue vibration about the fore-castle during the working of the engines has been remedied by heavier bracing, at inconsiderable cost. This temporary "structural weakness" was not the fault of the contractor, but of the plan. Material improvements were made in the ship's engines during the progress of construction, and she appears to-day a sound, strong, and well-built vessel, creditable to her builders alike in honest material and honest workmanship, and creditable no less to the administration of the Department which adopted the design and carried it to successful completion.

The *Charleston*, of 3,730 tons, shows 6,666.16 horse-power, 18.2 knots average speed for four hours, and 18.3 knots speed during the best hour of the four. The Japanese *Naniwa*, of 3,730 tons, built in England from the same designs, has made 7,650 horse-power and 18.9 knots average speed.

The *Yorktown*, of 1,700 tons, has developed 3,398.25 horse-power, 15.6 knots average speed, and 16.4 knots speed during the best hour of the four. At her subsequent steam trial, September 21, 1889, the speed obtained was 16.7. The English *Archer*, of 1,770 tons, has made 3,982 horse-power, and 17.2 knots. The *Racoon*, also English, of the same tonnage, shows 4,582 horse-power, and 17.6 knots. Both are the average results of a four-hours' trial.

The *Petrel*, of 870 tons displacement, has developed a mean speed of 11.55 knots, and a maximum speed for one hour of 12.85 knots. The English *Maggie*, of 805 tons, at her four-hours' trial in May last, showed a speed of 14.13 knots.

In reference to the very low average made by the *Petrel*, as compared not only with the *Maggie* but with the lower standard that prevailed in 1882, it should be stated that the trial was managed, as all such trials are, by the contractor. It being for the contractor's interest to get the best results, it is reasonable to suppose that he will take care to have all the circumstances such that the vessel will make the best possible showing. The ignorance or inexperience of the contractors, however, in the case of the *Petrel*, was such that the trial can not be regarded as a fair indication of what the vessel can do. The coal used was of bad quality and the firemen were without experience. In the four hours' trial the ship began with a collective horse-power of 1,473 and a speed of 14 knots, which ran down before the trial was over to a horse-power of 540 and a speed of 9.6. These figures prove conclusively that the results were caused, not by poor engines, but by poor engineering.

There is one foreign cruiser, not exactly corresponding in size to any of the four recently completed, which has surpassed all the results that our vessels, or any other vessels, have been able to attain. This is the Italian cruiser *Piemonte*, built by the Elswick Works in England, and recently completed and placed in commission. In size the *Piemonte* is intermediate between the *Yorktown* and *Charleston*, having a displacement of 2,500 tons. She has a protective steel deck and an armament of quick-firing guns. In a trial on May 14, 1889, she developed 13,000 horse-power and a speed, for an hour and a half, of 22 knots per hour. Her two runs over the measured mile showed an average speed of 22.3 knots. She is undoubtedly the fastest cruiser now afloat, as the *Esmeralda* was five years ago; and she bears to the new United States cruisers about the same relation in comparative speed that the *Esmeralda* did to the first three cruisers.

In reference to the speed results of the *Charleston*, *Yorktown*, and *Petrel*, it appears that among contemporary vessels of the same class abroad, some few may be found, as was the case with the cruisers of 1882, whose recorded trial shows a figure slightly in excess. Upon this point, it must be stated that, while the Department and the country should never be fully satisfied unless their new vessels actually equal the best results obtained elsewhere, the public must not be misled by the figures of the foreign trials. The contract trials in Europe are carried on by ship-builders of great experience, who understand much more fully than those in this country the way to get the highest attainable results out of the ship for a short time. Every detail is attended to that can contribute to this result, and the forcing of the engine is sometimes carried so far that, after it has shown its capabilities in the contractor's trial, and been accepted on the strength of that trial, it is found by its owners, when put to every-day use, to have become a

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damaged article. From this misfortune we have so far been exempt, and we have good reason to be satisfied that it is so, even if our speed results are thereby rendered less sensational.

It is notorious that the fast war steamers abroad, of whose wonderful performances on contract trials we hear so much, rarely or never equal these results when put into actual service, and not infrequently commanding officers have been instructed not to attempt to obtain contractor's results for fear of further injury to the machinery. Thus the *Naniwa* is reported to have made 18.9 knots at the contractor's trial, while the *Takachiho*, her sister ship, made only 17.88 on being tried by her Japanese purchasers. It is a noteworthy fact that most of our new vessels, namely, the *Baltimore*, *Chicago*, *Boston*, *Dolphin*, and *Yorktown*, have, at later trials, or in later service, beaten their own record on the contract trial; and it is equally a fact that the usual experience with European vessels is just the other way.

The net results of the Department's operations for the last seven years are more than satisfactory. The assaults made, with more audacity than judgment, upon the four experimental cruisers of 1882 have been met successfully by the performance of the vessels, and all doubts of their efficiency, if such doubts ever really existed, are laid at rest forever; while the four cruisers of 1886, assuming that the *Petrel* will eventually come up to the mark, in their advance over their predecessors, prove that both designers and constructors have kept themselves abreast of the extraordinary development in ship-building since the earlier cruisers were laid down, and have taken full advantage of the information and experience which they were enabled to acquire through the measures adopted at that time by the Navy Department.

#### INCREASE OF THE NAVY.

To stop now in the work of reconstruction, is to abandon everything we have gained. We have proved that at a time when war-ship construction had seemed almost a lost art in this country, American mechanics could create it anew and place the United States where it was seventy years ago, when the vessels of its Navy were the best of their class afloat. We have fostered and developed a branch of industry in America which may, if kept up, attract to itself no inconsiderable share of the profits that now go to ship-builders abroad. We have secured for our Navy a certain number of excellent and useful vessels of the unprotected cruiser type, at a fair and reasonable cost. We have thus laid a solid foundation. But we must not for a moment deceive ourselves by supposing that we have an effective Navy. We have two distinct and widely separated ocean frontiers to protect, and there is only one way in which they can be protected, namely, by two separate fleets of armored battle-ships, with coast-defense ships suitably distributed to cover the most exposed localities.

Of the great cities on the Atlantic, and of the long stretch of unprotected coast on the Gulf, from Key West to the Rio Grande, which is

faced by the territorial possessions of a multitude of foreign states, it is hardly necessary to speak at length. On the Pacific coast there are large and growing interests of vital importance, not only to that immediate neighborhood but to the whole country, throughout its length and breadth. Among the enterprising and rapidly growing cities which form the bulwarks of our commercial prosperity in that quarter, there are some, like Tacoma and Seattle, which it is physically impossible to protect by any land fortifications. To abandon these cities, defensible only by the Navy, to the possible attacks of an enemy, and to subject to needless risk this coast and the vast region which it borders, a region second in importance to no other part of the United States, is to be guilty of an almost criminal negligence.

The necessities of our vulnerable position therefore demand the immediate creation of two fleets of battle-ships, of which eight should be assigned to the Pacific and twelve to the Atlantic and Gulf. They must be the best of their class in four leading characteristics: armament, armor, structural strength, and speed. The last is nearly as essential to the battle-ship as it is to the cruiser. It may safely be assumed that, other things being equal, the battle-ship of the highest speed will as a rule be the victor in action, for she can choose her position and keep the enemy at a disadvantage. Not only must the speed of our battle-ships be high, but it must be uniformly high, for the speed of the fleet is regulated by that of the slowest vessel.

In addition to the battle-ships, the situation of the country requires at least twenty vessels for coast and harbor defense. These vessels, although restricted in their range of effectiveness, are necessary components of a naval force which has a sea-coast to defend. Their employment as floating fortresses requires that they should have a powerful battery and the heaviest of armor, combined with moderate draft. At the present time eight vessels of this type are under construction, five of which are reconstructed monitors.

The one problem now before the Government, in the matter of a naval policy, is to get these forty vessels built at the earliest possible moment. The steps necessary to their completion, namely, legislation, design, and construction, can not take less than five years in the case of each one. Unless the existing yards, public and private, are enlarged and restocked with plant, not more than eight could be built at one time, and the construction of the others would have to wait for the launching of the first. Using the utmost promptness, the ships most essential to efficient protection could not be supplied in less than twelve or fifteen years.

It is therefore recommended that the construction of eight armored vessels be authorized at the coming session, and that they be of the type of battle-ships rather than coast-defense ships; the former being more generally serviceable, and there being only three of them now in process of construction as against eight of the latter.

In reference to fast cruisers, all modern experience goes to show that they are essential adjuncts of an armored fleet, and the proportion of

three cruisers to one battle-ship is believed to be sound and reasonable. This would make the future navy consist of 20 battle-ships, 20 coast-defense ships, and 60 cruisers, or 100 vessels in all, which is believed to be a moderate estimate of the proper strength of the fleet. Of the 60 cruisers required, 31 are now built or authorized. For an increase in the number of cruisers, considered simply as auxiliaries to the fighting force of battle-ships, we may wisely wait until the latter are in process of construction.

It must be remembered, however, that cruisers have another and equally important function in the attack and defense of commerce. Any staunch vessel with a good coal capacity and the highest rate of speed, armed with a few rapid-firing guns, though built and used principally for commercial purposes, may by certain adaptations in her construction be made readily available for this form of warfare. The fast transatlantic liners, nationalized in foreign countries, but supported and maintained by American trade and American passengers—many of them, even, owned by American citizens—are a powerful factor in the naval force of the Governments whose flag they bear and at whose disposal they must place themselves in time of war.

It is a matter for serious consideration whether steps may not be taken towards the creation of such a fleet of specially adapted steamers of American construction, owned by American merchants, carrying the American flag, and capable, under well-defined conditions, of temporary incorporation in the American Navy. The advantages of such an arrangement, which enlarges the merchant marine and makes it at the same time self-protecting, are overwhelmingly great. The difficulty is that American capital will not be drawn into the enterprise unless it can be sure of specific compensation for the concessions which it makes to the Government, first, in the adaptation of its vessels to the latter's needs, and secondly, in the surrender of a privilege to use them when the exigency arises.

In the absence of such an arrangement the naval policy of the United States can not neglect to take account of the fleets of fast cruisers which foreign states maintain under the guise of passenger and merchant steamers. They constitute an auxiliary navy, and must be reckoned as a part of the naval force of the governments maintaining them. It is difficult to imagine a more effective commerce destroyer than the steam-ship *City of Paris*, armed with a battery of rapid-firing guns. She can steam over 21 knots an hour, and can average 19.9 knots from land to land across the Atlantic. No man-of-war could overtake her; no merchantman could escape her. A fleet of such cruisers would sweep an enemy's commerce from the ocean. This fact is well understood in Europe, and states that are unprovided with a convertible merchant fleet are preparing to meet the possible emergency by partly-protected cruisers that are substantially as fast as the *City of Paris*. Of this type the *Piemonte* is the latest development, and others equally fast are now building.

Our deficiency should be supplied either by a line of fast merchant-men, constructed with special reference to use in time of war, which will enable the Government to avail itself of their services at critical moments, or we should build a fleet of at least five first-class cruisers of the very highest rate of speed, certainly not less than 22 knots. The displacement of these vessels should not be less than 4,000 tons. Even such a fleet will not supply the want of swift merchant-steamers for coaling and transport service. Colliers and transports must alike be fast, for they can not fight; and the collier can take no chances of capture, for she carries the life of the fleet.

In determining the size of the smaller type of cruisers, one point is settled: All steel cruisers must be large enough to admit of a double bottom. A vessel like the *Yorktown*, which has but three-eighths of an inch of steel on her bottom, could hardly escape sinking if she touched a rock, no matter how lightly. Such a ship must not strike. She can not run any of the risks which the old-fashioned ships used to run every day with comparative safety, for a steel bottom will be penetrated where a wooden one would be merely scarred. Besides the *Yorktown*, we have the *Concord*, the *Bennington*, and the three 2,000-ton cruisers (Nos. 9, 10, and 11), which are marked by this defect. It is not well to add to the number.

In reference to the gun-boat class, any large increase in it must be condemned. This class is now represented by the *Petrel* and the two 1,000-ton vessels (gun-boats Nos. 5 and 6). To make any considerable addition to it is consuming the revenues of the Government without any proportionate benefit. It is chasing the shadow and losing the substance. Such vessels add nothing to the real strength of a naval force. A cruiser to be useful must be fast enough to overtake any merchantman and to escape from any more powerful ship of war. These vessels have neither the strength to fight nor the speed to run away. A limited number of 1,000-ton vessels can be utilized in certain special kinds of service on foreign stations, and for this particular purpose it is recommended that three such vessels be constructed. Any larger increase at the present time would be injudicious and wasteful.

Apart from the want of battle-ships the most marked defect of the present fleet is in torpedo-boats. The number of these boats owned by fifteen foreign States is as follows:

Country	Torpedo-boats.	Country.	Torpedo-boats.
England .....	207	China .....	26
France .....	191	Denmark .....	22
Russia .....	138	Japan .....	21
Italy .....	128	Sweden and Norway .....	19
Germany .....	98	Holland .....	16
Austria .....	60	Spain .....	15
Greece .....	51	Brazil .....	15
Turkey .....	29		

The United States has one such boat under construction. This branch of defense can not safely be neglected any longer. It is high time that steps should be taken to supply these essential constituents of a naval force. I therefore recommend that the construction of at least five torpedo-boats of the first and second classes, in suitable proportions, be authorized, as a beginning, at the coming session of Congress.

### PROGRESS OF RECENT CONSTRUCTION.

#### ARMORED VESSELS.

##### BATTLE SHIPS.

Name.	Keel laid.	Where built or building.	Displacement.	Estimated horsepower.	Cost.*	Date of act authorizing building.	Remarks.
			<i>Tons.</i>				
Texas.....	1889	Navy-yard, Norfolk, Va.	6,314	8,600	\$2,500,000	Aug. 3, 1886..	Commenced; keel partly laid.
Maine .....	1888	Navy-yard, Brooklyn, N. Y.	6,648	9,000	2,500,000	...do .....	One-fourth completed.
Armored cruiser No. 2.			7,500		3,500,000	Sept. 7, 1888..	Being designed.

#### COAST-DEFENSE SHIPS.

Puritan.....	1875	Roach's Yard, Chester, Pa., and Brooklyn navy-yard.	6,060	3,700	.....	Mar. 3, 1883; Mar. 3, 1885; Aug. 3, 1886; Mar. 3, 1887.	Half finished.
Amphitrite .....	1874	Harlan and Hollingsworth, Wilmington, Del., and Norfolk navy-yard.	3,815	1,600	.....	...do .....	Do.
Monadnock.....	1874	Navy-yard, San Francisco, Cal.	3,815	3,000	.....	...do .....	Two-fifths completed.
Miantonomoh....	1874	Roach's Yard, Chester, Pa., and Brooklyn navy-yard.	3,815	11,426	.....	...do .....	Do.
Terror.....	1874	Cramp's, Philadelphia, and Brooklyn navy-yard.	3,815	1,600	.....	...do .....	Half finished.
Coast-defense vessel.	....	Union Iron Works, San Francisco, Cal.	4,003	5,400	1,628,950	Mar. 3, 1887 ...	Under contract of June 14, 1889.
Steel cruising monitor.	....		3,130	7,500	1,500,000	Mar. 2, 1889 ...	Plans completing. Ready for advertising in two months.
Ram for harbor defense.	....		2,000			...do .....	Plans not commenced.

\* Statutory limit or contract price.

† Indicated.

‡ About.

Proposals having been invited January 28, 1889, for the machinery of the *Texas*, now in course of construction at the Norfolk navy-yard, were received in due course and opened May 1, as follows:

P. Morris Company, Philadelphia, Pa. (machinery to be constructed according to Department's plans and specifications, with certain modifications thereof and changes therein, as proposed by the bidder).....	\$694,750
Richmond Locomotive and Machine Works, Richmond, Va., (machinery to be constructed according to Department's plans and specifications)....	634,500
F. Palmer, jr., & Co., New York, N. Y. (machinery to be constructed according to Department's plans and specifications).....	682,500
Southwark Foundry and Machine Company, Philadelphia, Pa. (machinery to be constructed according to the Department's plans and specifications)	645,800
Charles Reeder & Sons, Baltimore, Md., (machinery to be constructed according to Department's plans and specifications).....	718,900

The bid of the Richmond Locomotive and Machine Works, of Richmond, Va., for \$634,500, was accepted, and a contract was entered into by the Department with this company on May 30. The contract provides that the machinery, which is to be constructed in accordance with the plans and specifications furnished by the Department, shall be completed and set up at the works of the contractor within two years and six months from the date of the contract, and be erected and connected on board the vessel and ready for delivery within one year thereafter.

Under the advertisement of the Department of November 20, 1888, inviting proposals for the construction of machinery of the armored cruiser *Maine*, now building at the New York navy-yard, only one bid was received, that of N. F. Palmer, jr., & Co., of New York, for \$735,000. This proposal was accepted, and the contract was executed April 3, 1889, for the construction of machinery in accordance with the plans and specifications prepared by the Department. The time allowed for completion is the same as in the case of the machinery of the *Texas*.

Under the act approved August 3, 1886, authorizing the completion of the double-turreted monitors *Puritan*, *Amphitrite*, *Monadnock*, and *Terror*, proposals have been received and contracts made during the year for the materials required to complete the *Monadnock* and *Terror*, and proposals have been received and contracts awarded for materials required to complete the *Amphitrite*. Plans for the proposed change of the *Puritan* having been approved by the Bureau of Construction, they were submitted to examination by the board of bureau chiefs, and after receiving a favorable report were approved by the Department, and the work was ordered on June 26, 1889. By these changes the armament and armor protection are greatly increased, and the quarters for the officers and crew are improved. A similar change was ordered August 30 in the *Amphitrite*. The details of these changes will be found in the report of the Chief Constructor.

The act of Congress approved March 3, 1887, appropriated towards

the construction of "floating batteries or rams or other naval structures to be used for coast and harbor defenses," \$1,000,000, and provided that the final cost of "said floating batteries, rams, or other naval structures, exclusive of armament, should not exceed \$2,000,000." As stated in the annual report of the Chief of the Bureau of Ordnance for 1888, an advertisement was issued inviting the submission of proposals, on the 4th of January, 1889, for the construction of a submarine boat under the authority conferred by the act. On February 15, to which date the time was subsequently extended, bids for the construction of the boat were received.

It had also been decided, as stated in the last annual report of the Department, under the authority conferred by the above-mentioned act, "to build one light-draft, heavily-armored, harbor-defense floating battery or ram." Designs having been prepared by the Bureaus of Construction and of Steam Engineering after consultation with the Bureau of Ordnance, advertisements were issued inviting bids to be submitted February 15, 1889, which time was subsequently extended to April 3. On that date the following proposals were received:

The William Cramp & Sons Ship and Engine-Building Company, Philadelphia, Pa. (hull and machinery to be constructed according to plans and specifications provided by the Secretary of the Navy, with certain modifications thereof and changes therein, as provided by the bidder) ..	\$1, 614, 000
N. F. Palmer, Jr., & Co., New York, N. Y. (hull and machinery to be constructed according to the Department's plans and specifications) .....	1, 690, 000
The Union Iron Works, San Francisco, Cal. (hull and machinery to be constructed according to the Department's plans and specifications) .....	1, 628, 950

On the 4th of April the Department appointed a Board, consisting of the Chiefs of the Bureaus of Ordnance, Equipment, Construction, and Steam-Engineering, to report as to the cost of the vessel, including the armament and equipment, in case of the acceptance of one of the proposals made, and whether within the limitation fixed by the act, namely, \$2,000,000, the vessel could be built, and also the submarine torpedo-boat before referred to. The Board was further directed to report "as to which of said companies is the lowest bidder," and to furnish the Department "with such recommendation as the Board may deem proper to make in the matter."

The Board, after careful consideration of the subject, reported that the two vessels could not be built within the limitation of \$2,000,000, and recommended that all the proposals for the submarine torpedo-boat should be rejected; and that the proposal of the Union Iron Works for the construction of the armored coast-defense vessel, being the lowest that conformed to the requirements of the Department's advertisement, plans, and specifications, should be accepted.

In accordance with this report, the Department, April 23, 1889, rejected all the proposals for the torpedo-boat, and on June 14 entered into a contract with the Union Iron Works for the construction of the armored coast-defense vessel, at a cost of \$1,628,950. The contract



provides that the United States shall furnish the necessary armor, armor bolts, and their accessories, trim the armor-plates to size within reasonable manufacturing limits, and drill and tap all necessary holes therein, and deliver the armor, etc., at the ship-yard of the Union Iron Works, who shall fit, fix, place, and secure the armor to the vessel, and furnish all other materials and labor required. The vessel is to be completed in three years from the date of the contract.

The plans for the three remaining armored vessels authorized by law are not yet completed. It is estimated that those of the armored cruiser of 7,500 tons will be ready in three months. The plans for the steel cruising monitor will be ready in two months, and the plans for the harbor-defense ram are not yet begun.

The Bureau of Construction recommends, with reference to the single-turreted monitors, that some action be taken looking to the reclaiming of these vessels from "their present worse than useless condition." In view of the fact that the amount necessary for this purpose will reach about \$100,000, and that the vessels, with their present ineffective guns, will be no material addition to the force of the Navy, the Department can not concur in this recommendation. The only use to which these vessels can be advantageously put is to assign them to service as practice ships for the naval reserve in those States which have created such a branch of the militia, should they be desired for the purpose.

## UNARMORED

Ship.	Type.	Keel laid.	Where built or building.	Displacement.	Horse-power, estimated.	Cost.*
Chicago.....	Cruiser.....	1883	Roach's yard, Chester, Pa. ....	Tons. 4,500	15,054	\$889,000
Boston.....	.....do.....	1883	.....do.....	3,189	13,780	619,000
Atlanta.....	.....do.....	1883	.....do.....	3,189	13,356	617,000
Dolphin.....	Dispatch vessel.	1883	.....do.....	1,485	12,240	315,000
Newark.....	Cruiser.....	1887	Cramp's yard, Philadelphia, Pa.	4,063	8,500	1,248,000
Charleston.....	.....do.....	1887	Union Iron Works, San Francisco, Cal.	3,730	16,066	1,017,000
Baltimore.....	.....do.....	1887	Cramp's Yard, Philadelphia, Pa.	4,400	9,000	1,323,000
Philadelphia.....	.....do.....	1888	.....do.....	4,300	10,500	1,350,000
San Francisco.....	.....do.....	1888	Union Iron Works, San Francisco, Cal.	4,083	9,000	1,428,000
Yorktown.....	.....do.....	1887	Cramp's Yard, Philadelphia, Pa.	1,700	13,398	455,000
Concord.....	.....do.....	1888	Delaware River Iron Works, Chester, Pa.	1,700	3,400	490,000
Bennington.....	.....do.....	1888	.....do.....	1,700	3,400	490,000
Vesuvius.....	Dynamite gun-boat.	1887	Cramp's Yard, Philadelphia, Pa.	970	13,200	350,000
Petrel.....	Gun-boat.....	1887	Columbian Iron Works and Dry Dock Company, Baltimore, Md.	870	11,100	247,000
No. 6.....	Cruiser.....			5,300		1,800,000
No. 7.....	.....do.....		Navy-yard, Brooklyn.....	3,000	10,000	1,100,000
No. 8.....	.....do.....		Navy-yard, Norfolk, Va.....	3,000	10,000	1,100,000
No. 9.....	.....do.....		Columbian Iron Works and Dry Dock Company, Baltimore, Md.	2,000	5,400	612,500
No. 10.....	.....do.....		.....do.....	2,000	5,400	612,500
No. 11.....	.....do.....		Harrison Loring, Boston.....	2,000	5,400	674,000
No. 5.....	Gun-boat.....			1,000	1,600	350,000
No. 6.....	Gun-boat.....			1,000	1,600	350,000
Steel practice vessel.				800	1,300	260,000
Torpedo boat No. 1.....		1888	Herreshoff's yard, Bristol, R. I.	99	1,600	82,750
Dynamite-gun boat No. 2.....						450,000

\* Statutory limit or contract price.

† Indicated

‡ Contract.

## VESSELS.

Ship.	Date of act authorizing building.	Contract executed.	Time allowed by contract	Remarks.
Chicago .....	Aug. 5, 1882, Mar. 3, 1883	July 26, 1883	<i>Mos.</i>	In commission.
Boston.....	do .....	July 23, 1883	.....	Do.
Atlanta.....	do .....	July 23, 1883	.....	Do.
Dolphin .....	do .....	July 23, 1883	.....	Do.
Newark .....	Mar. 3, 1885, Mar. 3, 1887	Oct. 27, 1887	24	Two-thirds completed; nearly ready for launching.
Charleston.....	Mar. 3, 1885	Dec. 28, 1886	18	Preparing for commission.
Baltimore.....	Aug. 3, 1886	Dec. 17, 1886	18	Preparing for commission.
Philadelphia.....	Mar. 3, 1887	Oct. 27, 1887	24	Launched; eight-tenths completed.
San Francisco .....	do .....	Oct. 26, 1887	24	Do.
Yorktown .....	Mar. 3, 1885	Jan. 31, 1887	12	In commission.
Concord .....	Mar. 3, 1887	Nov. 15, 1887	18	Boilers in; eight-tenths completed.
Bennington.....	Mar. 3, 1887	Nov. 15, 1887	18	Boilers in; eight-tenths completed ready for launching.
Vesuvius .....	Aug. 3, 1886	Feb. 11, 1887	12	Reported ready for delivery.
Petrel .....	Mar. 3, 1885	Dec. 22, 1886	12	Preparing for commission.
No. 6 (cruiser) .....	Sept. 7, 1888	.....	.....	Design commenced.
No. 7.....	do .....	.....	.....	To be constructed at New York navy-yard. Bids for material have been received and work commenced.
No. 8.....	do .....	.....	.....	To be constructed at Norfolk navy-yard. Bids for material have been received and work commenced.
No. 9.....	do .....	Nov. 2, 1889	30	Contracted for.
No. 10.....	do .....	do .....	30	Do.
No. 11.....	Sept. 7, 1888	Nov. 11, 1889	30	Contract awarded Nov. 1 to Harrison Loring.
No. 5.....	Mar. 2, 1889	.....	.....	Under advertisement.
No. 6 (gunboat).....	Mar. 2, 1889	.....	.....	Do.
Steel practice vessel .....	Sept. 7, 1888	.....	.....	Under advertisement.
Torpedo boat No. 1 .....	Aug. 3, 1886	Mar. 1, 1888	15	Completed except boiler.
Dynamite-gun boat No. 2 .....	Mar. 2, 1889	.....	.....	Not yet begun.

Of the unarmored vessels in course of construction, four have been completed within the past year, as follows: The *Yorktown*, accepted April 4; the *Petrel*, October 24; the *Charleston*, November 6, and the *Baltimore*.

By advertisement of May 24, 1889, the Department invited proposals for the construction of the three cruisers of about 2,000 tons displacement each, at a cost of not more than \$700,000 each, authorized by act approved September 7, 1888; and by another advertisement of June 14, invited proposals for the construction of the two cruisers of about 3,000 tons each, at a cost of not more than \$1,100,000 each, authorized by the same act. All the proposals were opened at the Department August 22, as follows:

For the construction of two 3,000-ton cruisers, Nos. 7 and 8:	
The William Cramp & Sons Ship and Engine Building Company, Philadelphia, Pa., for the construction of one of said cruisers (hull and machinery to be constructed according to Department's plans and specifications) .....	\$1,225,000
Same company, for the construction of the other of said cruisers (hull and machinery to be constructed according to Department's plans and specifications) .....	1,225,000
For the construction of three 2,000-ton cruisers, Nos. 9, 10, and 11:	
The Bath Iron Works, Bath, Me., for the construction of one of such cruisers (hull and machinery to be constructed according to Department's plans and specifications) .....	780,000
The William Cramp & Sons Ship and Engine Building Company, Philadelphia, Pa., for the construction of one of such cruisers (hull and machinery to be constructed according to Department's plans and specifications) .....	875,000
Same company, for the construction of another of such cruisers (hull and machinery to be constructed according to Department's plans and specifications) .....	875,000
Same company, for the construction of the other of such cruisers (hull and machinery to be constructed according to Department's plans and specifications) .....	875,000

As the amounts for which these several proposals offered to construct the vessels were in excess of the limit fixed by Congress all of them were rejected. The Department then decided, as authorized by the act to build the two 3,000-ton vessels in the navy-yards, and on October 1, 1889, advertised for proposals for steel required for the construction of cruiser No. 7 at the New York navy-yard and for cruiser No. 8 at the Norfolk navy-yard. On the 5th of October another advertisement invited proposals for materials for use in the construction at the New York navy-yard of the machinery for both these cruisers. Proposals have been received under both these advertisements, and contracts have been awarded for 2,284 tons of steel for the hulls of these vessels.

It was decided to re-advertise for proposals for the construction of the three 2,000-ton vessels, and the advertisement was accordingly issued August 24. The law having directed that in the contract for these vessels such provisions for increased speed and premium should be

made as in the discretion of the Secretary of the Navy might be deemed advisable, the conditions of the previous advertisement were so far modified as to reduce the required speed from 18 knots to 17 knots, and to fix the premium for increased speed at \$25,000 for each quarter-knot in excess of the guaranteed speed of 17 knots. A penalty of \$25,000 was affixed for every quarter-knot that the vessels failed of reaching the guaranteed speed; and in case of failure to develop and maintain for four consecutive hours a speed of 16 knots, the vessels could be rejected. The time fixed for completion was also extended from two years to two years and six months.

The following proposals were received:

The Union Iron Works, San Francisco, Cal., for the construction of one of said vessels (hull and machinery to be constructed according to Department's plans and specifications) .....	\$775,000
Same company, for the construction of two of said vessels (same plans and specifications) .....	1,450,000
Same company, for the construction of three of said vessels (same plans and specifications) .....	2,054,001
N. F. Palmer, jr., & Co., New York, N. Y., for the construction of one of said vessels (same plans and specifications) .....	674,000
Columbian Iron Works and Dry Dock Company, Baltimore, Md., for the construction of one of said vessels (same plans and specifications) ...	625,000.00
Same company, for the construction of two of said vessels (same plans and specifications) .....	1,225,000.00
The Bath Iron Works, Bath, Me., for the construction of one of said vessels (same plans and specifications) .....	675,000.00
Same company, for two of said vessels or three of said vessels at same rate.	
Harrison Loring, Boston, Mass., for the construction of one of said vessels (same plans and specifications) .....	674,000.00

October 28 the Department awarded to the Columbian Iron Works and Dry Dock Company of Baltimore, Md., contracts for the construction of two of these cruisers for the sum of \$612,500 each, and on the first of November awarded to Harrison Loring the contract for the construction of the other cruiser for the sum of \$674,000.

The Department, on November 19, invited proposals for the construction of the two vessels (gun-boats Nos. 5 and 6) of 1,000 tons, authorized by the act of March 2, 1889, and of the steel practice vessel of 800 tons, authorized by the act of September 7, 1888. These proposals will be opened in January.

The dynamite-gunboat *Vesuvius*, authorized by the act of February 11, 1887, has been completed but not yet accepted.

Of the two remaining unarmored vessels authorized by law but not yet completed, the most important is the cruiser of 5,300 tons (cruiser No. 6). The designs of this vessel are begun. The second vessel is the dynamite gunboat No. 2, of the *Vesuvius* type, which was authorized by the act of March 2, 1889, under the proviso that the Secretary of the Navy should be satisfied, after official tests made with the *Vesuvius* and her guns, as to the efficiency of the armament of that vessel. Action

has therefore been deferred until the final decision as to the *Vesuvius*.

The appropriation for the fiscal year now current provided for the construction or purchase by contract of four steam-tugs. One of these, the *Triton*, has been purchased, and another is under consideration. Bids for the two remaining tugs have been received within the statutory limit.

#### ENLISTED MEN.

Of equal importance with the construction of suitable vessels is the creation of an efficient personnel. A ship is worth what her captain and crew are worth. She is of no use unless her officers and men have the qualities to fight her. To insure the thorough efficiency of the corps of enlisted men in the Navy, three things are necessary: first, that it should be composed of American citizens or of those who have declared their intention to become citizens; secondly, that they should have adequate training for their work; and, thirdly, that the system of enlistment and discharge should be so regulated as to secure the retention of good men in the service.

At the present time the crews of our naval vessels are in large part composed of foreigners, or of men whose nationality is uncertain, and who are ready to serve any government that will pay them. It can not be expected that crews so composed will be a safe reliance for the country if their services should be needed in war. Such men are held by nothing but their contract of enlistment, and subject at the first temptation to desert the flag of a country in which they have never resided, and to which they are bound by no ties of birth or allegiance. To them the flag represents nothing. The American who deserts must expatriate himself, but the foreigner who deserts the American service goes to his own home. For a man so placed desertion has no penalties.

In the matter of training, the altered conditions of naval warfare and the exceptional character of the implements now employed have made great changes necessary. In the old sailing frigate any mariner could in a short time be converted into a good man-of-war sailor, and ships were manned chiefly and successfully by men of this class both in our own country and in Europe. Even at that time training was of great importance, above all, training in the handling and fighting of guns; and it was to the superior skill of our American seamen in this respect that the victories of the war of 1812 were largely due. At the present day the necessity of training has greatly increased. It is not to be supposed that men taken at hap-hazard from the sea faring class can supply, after a little practice and drill, as was formerly the case, efficient crews for such complicated structures as the modern ships of the Navy armed with modern guns. The training required to make good seamen can only be given by taking them in their youth and putting them through a thorough course of practice. Even then they will hardly reach a fair standard of efficiency until after some years of experience.

To meet the want of trained American seamen, the naval-apprentice system was established. The Department, at great labor and considerable expense, has steadily improved this system, until at the present time it turns out apprentices of excellent quality. From all this, however, the Navy derives little benefit. All terms of enlistment of apprentices now expire at twenty-one years of age. When they reach this point the majority of them leave the service forever. They have received an education at great expense to the Government, and yet have been too short a time in the service to have formed an enduring attachment to it. They carry off with their discharge the benefits of the Government's outlay, and apply them to the pursuit of other careers. The Government educates them as boys to lose their services as men, and the result is that while we have provided an elaborate system of training, we are forced to depend for seamen on an untrained service largely composed of foreigners.

The plain remedy lies in a statutory extension of the term of enlistment to twenty-four years of age. During the additional three years, the formation of associations and a mature judgment will lessen the inclination for change, and the Government will get the services of those whom it has trained, for at least one full cruise. In the English navy, the adoption of a rule retaining those who enlist as boys until the age of twenty-eight or thirty has completely changed the character of the enlisted force.

It is further recommended that the number of apprentices be increased from 750, as now allowed by law, to 1,500, making the total enlisted force 9,000. At the same time, the course in the training-ships should be extended by the formation of a special class for training in gunnery on board a ship devoted exclusively to this purpose. The incalculable importance of giving to enlisted men this training, especially in view of the change in naval armaments that is now in progress, has induced me to set apart the *Lancaster* as a gunnery-ship; and I strongly urge that authority be given to procure for her at once a modern battery.

To perfect the system of manning the Navy, a further reform is needed in the method of enlistment. Under existing law (Rev. Stat., sec. 1418) men "may be enlisted to serve for a period not exceeding five years, unless sooner discharged by direction of the President." Although this law was enacted as long ago as 1837, the custom of the Department has been to enlist men as a rule for three years, and the statutes relating to honorable discharges have been conformed to this usage.

The duration of a naval cruise is, in general, three years. The crews of vessels preparing for sea are necessarily brought together in receiving-ships before she sails, frequently several months before, as the completion of her outfit may be delayed. As the crews are enlisted for exactly three years, in the majority of cases the time of the men expires several months, sometimes even a whole year, before the ship returns, and the advance of 25 per cent. additional pay, to which



those holding over are entitled under the law, is a heavy addition to the cost of maintenance. To remedy this defect the Department proposes to adopt a four-years' term of enlistment, and it recommends that the laws (Rev. Stat., sections 1426, 1573) relating to honorable discharges after three years' service, and to allowances upon a three-years re-enlistment, be amended accordingly.

The lengthening of the term of enlistment, although an important measure, will not secure a character of permanence in the corps of enlisted men. In order to obtain a body of trained American seamen upon which the Navy and the country can rely, it is absolutely necessary that the whole system of temporary enlistment should be replaced by a continuous-service system, the four years' term being retained only to meet necessary emergencies. This system should be based upon the principle of retaining the services of the enlisted man for life. We shall never get the crews that we need until we make the navy a career for the seamen as well as for the officers. To accomplish this the continuous-service man should be permanently enlisted, and be entitled to retirement on three-fourths pay after thirty years of service, as provided by law, (Act of February 14, 1885) for the Army and Marine Corps. There is no reason for a distinction between the Army and Navy. No alien should be accepted for continuous service, and no man above the age of thirty-five, unless he has had previous naval experience. At the end of the first four years of service he should have an option of taking his discharge or remaining, but failing to take it at that time, his connection with the service should thenceforth be permanent, unless the Department should, in its discretion, grant his application for discharge, or unless he should be removed by sentence of a court-martial. Discharges in any case should work a forfeiture of all prospective benefits of pay and retirement. Continuous-service men should be entitled to one month's leave for each year of service, to be granted at the convenience of the Navy Department, and to be cumulative up to four months, which will be equivalent to the three months' leave now granted for re-enlistment, and which may be similarly commuted, and a small addition, of \$1 per month or thereabouts, should be made to the pay of the various ratings for each completed term of four years' service.

The reform proposed above has been carefully considered, and is believed to be indispensable to the efficiency of the corps of enlisted men. In no other way will it be possible to obtain for the Navy American seamen of the required experience and qualifications. The service is now entering upon a new era, in which the obsolete fleet of eight years ago is to be replaced by modern constructions, which have been acquired at considerable cost, and are the product of the highest professional intelligence and skill. To risk this new fleet in the hands of mongrel crews, and to diminish, if not destroy, its efficiency for service by a bad system of manning the Navy, is a short-sighted and foolish policy that can only result in loss and disaster.

Under existing law (sections 4810, 4813, Revised Statutes) pensioners who become inmates of the Naval Home, formerly known as the Naval Asylum, are obliged to relinquish their pensions during their residence at the Home. A similar provision formerly existed with reference to the Soldiers' Home, but it was done away with by the act of March 3, 1883, which provided that pensioners therein should continue to draw their pensions under certain regulations. As there is no reason whatever for this discrimination, which works great injustice to naval pensioners, the Department recommends the passage of a law placing them on the same footing with their comrades of the Army.

#### NAVAL RESERVE.

The question of the creation of a naval reserve demands the early attention of Congress. This reserve should be composed of ships, officers, and seamen. I have spoken elsewhere of the necessity of making arrangements by which the owners of merchant steamers may be induced to adapt their vessels to naval use, so that the Government may employ them as an auxiliary force in time of war. During the civil war the number of ships in the Navy increased from 90 to 700, and the efficiency of this force would have been incalculably strengthened had provision been made beforehand for adapting vessels to war service.

The necessity for a trained reserve of officers and seamen is equally great. In accordance with the wise policy of American institutions, the force maintained constantly in the service is small. Any sudden demand upon this force would compel immediate expansion. Arrangements should be made beforehand to meet this demand.

The numerical strength of our Army is not measured by the standing force, but by the trained militia behind it. The same should be true of the Navy. The necessity is even greater in this branch of the service, because a naval militia must have a special training to render it efficient in case of emergency, and it must be drawn from a limited portion of the population.

The subject has already received considerable attention, both in Congress and in the State legislatures. Congress has as yet failed to pass any law on the subject, but the legislatures of several States, taking the initiative, have made arrangements for the creation of a naval militia. In so far as these measures require the co-operation of the United States Government, I am heartily in favor of giving it. Where stationary vessels are desired for purposes of gunnery training, I recommend that the Department be authorized to furnish such vessels as are now laid up, unfit for sea service, to States making provision for a naval militia, upon their request. Authority should also be given for the issue of arms, and such legislation should be adopted by Congress as is necessary to give the new system vigor and efficiency.

## NAVY-YARDS.

On the broad question, which arose in the case of the two 3,000-ton cruisers, of the comparative advantages of the two systems of naval construction, the first in the Government yards and the second by contract with private firms, the Department is firmly of the opinion that the latter is the best method. The importance of encouraging private enterprise in this direction and of creating and developing one of the most valuable and useful industries to which American labor and capital can be devoted is sufficient to turn the scale, provided that the results obtained are equally good. The success of the experiments made thus far in constructing modern ships by contract proves conclusively that our private works and workmen have the skill and talent to give the Navy as good ships as the world affords.

The recent growth and extension of the ship-building industry is a gratifying evidence of the benefits that have come from this encouragement by the Government. The builders have met the demands of the Department in a large and enterprising spirit. Additional capital has been invested, workmen have been trained, and materials have been improved to answer the requirements of the official inspectors, new processes have become familiar, and one difficulty after another has been overcome. It may reasonably be expected that as ship-building in America is gradually improved and cheapened, additional private business will be attracted to these growing establishments, until in time the world's market for ships will be divided between this country and Europe.

All these advantages are lost by a policy that confines the construction of vessels exclusively to the navy-yards. Still, it is advisable that the Navy should build some of its ships. The number of private concerns is so small that circumstances might readily arise which would place the Department at the mercy of combinations. To prevent this it must itself enter the field and become at least a possible competitor with other bidders. Apart from this danger, and supposing that there were room enough at private yards, which there is not at the present time, for them to undertake all the large vessels that we need, the Government should have at its command the skill and the plant for building its vessels occasionally, and for repairing them at all times. For this purpose its own officers must have practice in carrying out their designs through all the stages to the finished product.

It is therefore believed that, while the great majority of our new vessels should be constructed by private builders, the Government yards should also be utilized to a limited extent. If they fail to produce as satisfactory results as the private builders, either in workmanship, in cost, or in time, those in whose charge they are should be held to a rigid responsibility. If this is exacted there is no inherent reason why building in the navy-yards should not be as well done as by any other process, and at approximately the same cost.

The only naval stations now in use as construction yards are Brooklyn, Norfolk, Mare Island, and Portsmouth, the last for wooden vessels only. The other navy-yards were closed, as far as construction and repair were concerned, by order of the Secretary, June 23, 1883, under the provisions of the act of August 5, 1882.

The Department having taken this action in pursuance of law, the yards referred to must remain closed until the law shall re-open them. It rests with Congress to decide whether the steps that have been taken shall be retraced, and the number of places at which vessels may be constructed and repaired shall be increased. At some future time such an increase will certainly become necessary. Whether it is needed now depends primarily upon the rapidity with which Congress desires to construct an effective navy. At present there are building sites for eight ships at Brooklyn and Norfolk, and for three at Mare Island. Of the former, five are now occupied. Provision has been made for supplying these yards with a working plant, which is now in part delivered. A further appropriation of \$50,000 is required for tools at Brooklyn. The three construction yards will then have a working outfit. If additional facilities are needed to hasten the construction of the navy, they may be provided either at Boston or League Island, each of which presents considerable advantages of situation.

The Boston navy-yard was fitted out several years ago with an excellent plant for building the old wooden ships. It has the necessary tools for making boats, furniture, blocks, spars, and other articles of outfit. It has facilities for building machinery and large tools. The yard is capacious and possesses substantial buildings, a stone dry-dock, three ship-houses, and three building slips. The harbor is a fine one with deep water, and the surrounding population affords an ample supply of good mechanics. A modern plant for building steel vessels, sufficient for work on an extensive scale, can be set up at moderate cost.

The League Island yard has remained since its transfer to the Navy Department largely in an undeveloped state. It has no ship-houses or building-slips, and a considerable part of its acreage, though not overflowed, is below the level of high water. Nevertheless the fact is recognized that it has exceptional advantages of site. It is in the center of the steel and iron producing and manufacturing district. In its immediate neighborhood are some of the largest ship-building establishments of the country. Finally, and of the greatest importance, it has fresh water in which to lay up iron and steel ships. In this last respect it stands alone, and this consideration is of itself sufficient to warrant its gradual improvement. The yard should therefore be put in such order as to make it available at least for purposes of repair. The appropriations made at the last two sessions, for a protecting wall and landing wharf, for filling in and dredging, and above all for a timber dry-dock costing half a million, which is now in process of construction,

clearly indicate that the last Congress had such an intention. A further outlay with the same general object would supply the necessary furnaces, tools, and other plant, at a reasonable figure. At some future time, as the steel vessels of the Navy are completed, the use of this yard with its fresh-water anchorage will become a necessity, and a comprehensive plan of development should then be considered.

With a view to determine plans for the gradual improvement of the League Island yard, a board of officers was appointed to consider the question in detail and to make a report to the Department. A second board was appointed to make a similar report in reference to the Brooklyn yard, the latter being the most extensive, and on the whole the best equipped of all the navy-yards: The reports of these boards, transmitted, respectively, October 14 and November 9, 1889, favor a large and expensive scheme of development, involving an outlay of \$14,000,000 in the case of League Island and \$8,000,000 in that of Brooklyn. There is nothing at the present time to warrant such an undertaking. The views of the Department in reference to League Island have been already stated. All that it now recommends for the Brooklyn yard is a sufficient appropriation to prevent the destruction of the property. The insufficiency of appropriations in recent years has permitted the cob-dock to go to ruin, and the wharves and buildings to become dilapidated. According to the report of the board on permanent improvement, many of the buildings have fallen into decay, and a few show signs of ultimate collapse.

The same state of things exists at other yards, and has existed for some time. The Chief of the Bureau of Yards and Docks, Commodore (now Rear-Admiral) D. B. Harmony stated in his annual report for 1886:

Scarcely a week has passed since I assumed control of this Bureau that reports have not been received of buildings tumbling down or liable to do so at any moment, roofs leaking to such an extent as to involve destruction of property, wharves rotting and falling into the water, and others so defective that they can not be used, waterservice defective on account of worn-out pipes, and a complaint of decay that implies general destruction.

The small appropriations for the past year have been expended with the greatest economy, and as much done as was possible with the limited amount to arrest this deterioration of the Government property, but being so inadequate it has had but little effect.

The present Chief of Bureau, in his report of the 14th of October last, tells the same story. He says:

The general condition of the buildings, wharves, and other Government property is lamentable, and Congress should make sufficient appropriations to arrest the decay and deterioration.

As stated by my predecessor in his last annual report, in a comparison of the naval expenditures for the fiscal years 1882-'84 with those for 1886-'88, considerable reductions were effected by him in the running expenses of the Bureaus. Among these reductions was one of \$550,000 for yards and docks. The appropriation referred to by Com-

modore Harmony as being so inadequate as to have little effect in arresting deterioration is one of the three in which the reduction was accomplished. The result is that the present administration of the Department finds itself handicapped by this tumble-down condition of navy-yard property. In accepting this responsibility it is proper that the facts should be made known. I propose to adhere rigidly to a policy of economical administration; but I do not propose to shirk the task of keeping the navy-yard property in a decent state of repair merely for the sake of showing a creditable balance-sheet. The state of things should be remedied at once, even if it costs money to do it. It will cost more now than it would have cost if it had been done earlier, and a further delay will only involve heavier expenditure. There is no economy in such a policy.

The plan which I would recommend is a simple one and involves no drain upon the Treasury. I shall have occasion to speak elsewhere in this report of the vast quantity of stores which have been allowed to accumulate at the navy-yards. These stores amounted in nominal value on June 30, 1888, to \$15,000,000. A large part of them are useless. So far from decreasing during the fiscal year 1888-'89, the stock on hand at its close showed a net increase of over \$189,000. I recommend that these useless stores, which are only a source of expense, be sold, and that out of the proceeds of sales the sum of \$550,000, being the amount by which the expenditures of 1886-'88 for yards and docks were reduced below those of 1882-'84, be re-appropriated for the preservation of Government property in the navy-yards. It is believed that this sum, in addition to the regular appropriation, will be sufficient, for a time at least, to arrest the deterioration that has been reported by the Bureau for the last four years.

In compliance with the act approved September 7, 1888, two commissions were appointed, one "to report as to the most desirable location on or near the coast of the Gulf of Mexico and the south Atlantic coast for navy-yards and dry-docks," and the other "to examine the coast north of the forty-second parallel, \* \* and select a suitable site \* \* for a navy-yard and dry-dock."

The conclusions of the first board, of which Commodore W. P. McCann is president, have been submitted as this report is going to press, and the Department has not been able to consider the subject sufficiently to make the recommendation required by law at the present time. The board visited and carefully examined all the available sites on the South Atlantic and Gulf coasts, and recommends the establishment of a navy-yard at Algiers, on the Mississippi River, opposite the city of New Orleans. The Navy unquestionably needs a station on the Gulf or its tributary waters, and the only question is the selection of the most suitable site. As soon as the subject can receive the attention which its importance deserves, the report will be transmitted to Congress with the Department's recommendations.

The suggestion that the naval station at Port Royal, S. C., be provided with a dry-dock and other necessary facilities for docking vessels is heartily approved.

The second commission, of which Capt. A. T. Mahan was president, presented, September 15, 1889, an able and exhaustive report, which is transmitted herewith. The commission narrowed down their selection to the shores of Puget Sound; and among the various sites in that neighborhood there were two that seemed entitled to special consideration. One of these was upon Lake Washington, a large sheet of water lying back of the city of Seattle. The other was at Point Turner, on the opposite side of the sound. The commission, while stating their opinion that "a suitable site can be found on the lake," decided in favor of Point Turner, mainly on strategic grounds.

As Lake Washington has no natural navigable outlet, it could only be made available by the construction of a canal of some 4 miles in length. The Commission believe that such a canal can be built, the only questions being those of cost and expediency, on neither of which did they feel called upon to express or form an opinion. The Department is therefore without information on this important point. The advantages of the lake site are a fresh-water basin, immunity from attack, and convenience of access to the center of population and of commercial and manufacturing activity. The second of these advantages the Commission find equally present at Point Turner. The first and third are entirely absent, but the Commission consider their force to be outweighed by the disadvantage, from a military point of view, of a canal as the only means of ingress and egress.

The Department, in presenting the report, is not satisfied as to the finality of its conclusions. Upon the military problem involved some difference of opinion exists among experts, and it is doubtful whether the strategic side of the question has not been considered too much at the expense of the industrial. On the other hand, the Department is not sufficiently advised as to the proposed canal to make any recommendations in reference to it. If, as would seem to be the case, it will be largely used for commercial purposes, and thus be of great benefit to the city of Seattle, the cost of its construction should not be borne wholly by the general Government. In any case, the Department can not recommend that the canal should be built solely for the benefit of a possible navy-yard on the lake.

The objects of a navy-yard are threefold: it may be a construction yard, a repair yard, or a naval station, or all combined. For a new construction yard the Navy Department has no use. A repair yard in the Northwest will be necessary at some future time, and the time is not very far off. Vessels in those waters must not be under the necessity of going 2,000 miles, to San Francisco and back, to clean their bottoms or to have slight repairs made. The site for such a yard is unquestionably in Puget Sound, which has all the advantages of favorable posi-

tion, great extent of navigable waters, freedom from dangers and from obstruction by ice, a temperate climate, a promise of extraordinary development, and great natural resources in coal, iron, and timber. A naval station there is needed now. Apart from the canal, the lake site would probably be the most desirable and also the cheapest, in view of the possibility, in fresh water, of substituting wood for masonry in the construction of wharves and docks. Until the Department sees some prospect of such a canal, however, it can not recommend this site, and if the canal should not be built, the station should be established at Point Turner.

Whatever policy may be adopted by Congress in reference to new navy-yards, or to the re-opening of those that are now closed, any extension of the existing system should be made with caution. The object of the Government at the present time is to get efficient ships and guns, and every expenditure for material development should be retrenched unsparingly, unless it tends directly to this result, or is necessary to keep in an efficient state the working establishment and the Government property ashore and afloat. The reduction adopted in 1883 was a wise policy. The changed conditions of to-day may modify that policy to a limited extent, but development should come slowly. Navy-yard officials tend naturally to a magnified view of their wants in the matter of improving the property in their charge, and do not feel the restraints which a close margin of profits imposes on a private manufacturer. The double character of the yard as a workshop and as a military post promotes this tendency, and the demands of the surrounding community strengthen it and give voice to it in Congress.

The number of military posts for naval purposes is none too large, but the number of work-shops should be limited strictly to actual necessities. Every increase of this kind draws after it an annual series of long bills for maintenance. If the door is once opened to large schemes of so-called improvement, upon official recommendations ably seconded, perhaps in part induced, by local influences, the Government will soon find that instead of maintaining its yards for the benefit of the fleet, it is maintaining its fleet for the benefit of the yards; and enough millions will in a short time have been spent to build the best navy in the world, with nothing to show for it but a large number of imposing but unnecessary shore establishments.

#### COALING STATION AT SAMOA.

In February last the Department purchased and shipped to Pago Pago 1,912 tons of coal. This coal was discharged and stored on the land leased by the Government.

In pursuance of the act approved March 2, 1889, the Department has caused surveys of the harbor to be made with a view to the selection of a site for a coaling station and for the location of the necessary wharf and store-houses. Rear-Admiral Kimberly, under whose direction



these surveys were made, has selected a suitable site, consisting of 121 acres of land. The necessity of establishing foreign coaling stations, and the increasing commercial importance of these islands, render it desirable to place this station as soon as possible on a permanent basis.

#### ORDNANCE.

The number of high-power steel cannon for the Navy completed to date includes two 5-inch, forty-eight 6-inch, eight 8-inch, and three 10-inch. During the past year twenty-one 6-inch guns have been finished at the Washington navy-yard, three at the West Point Foundry, and three at the South Boston Iron Works. Besides these, nine guns are in course of construction.

The material for several guns has been received from the Bethlehem Iron Company, and the Bureau has begun the manufacture of four of them for the *Baltimore* and two for the *Charleston*. These are the largest and most powerful guns ever made from steel produced wholly in the United States. Two 10-inch guns have been completed, making three now ready for the armament of the *Miantonomoh*. Designs have been made for the 12-inch guns, of which four are to be mounted on the *Puritan* and two on the *Texas*.

Experiments continue to be made with promising results with a view to perfecting carriages, fuzes, primers, and the various classes of powder. The question of projectiles is still in an unsatisfactory state. The cast-steel common shell so far furnished fail to show sufficient resistance to disrupting strains caused by their passage through steel plates such as are used on the sides of unarmored vessels. In armor-piercing shells we are far behind foreign manufacturers, the projectiles breaking up after striking or entering the target. In order to induce American manufacturers to produce better results, proposals have been invited for projectiles to the amount of \$200,000.

Of the ninety-four Hotchkiss guns contracted for, seventy-seven have been delivered, all of which, together with their ammunition, have been manufactured in the United States. The Maxim automatic machine guns having undergone a satisfactory test, negotiations with the company have been entered into for the supply of sixty-six guns of this type of American manufacture. The domestication of their manufacture in the United States is now assured, and thus an important gain has been made to the producing capacity of the country.

The Bethlehem Iron Works have completed their gun-forging plant, and the 120-ton hammer to be used in forging armor-plates has made good progress. The plant erected at the works is of superior character. The first gun-forgings were delivered in June last, and it is thought that every endeavor will be made by the company to hasten all the forgings contracted for.

The gun-factory at the Washington navy-yard, under the direction of Commander William M. Folger, has made extensive progress during the year. The 25-ton and 40-ton cranes are working satisfactorily, and

have shown their great usefulness. The 110-ton crane is nearly completed. All the boilers, and the engines, with one exception, are in place, and a large number of the machine tools are erected and running. The powerful tools for the manufacture of the heaviest guns are still to be procured, the offers thus far made on bidders' designs having been excessive in price, and the Department having therefore decided that it would call for new bids on its own designs. The completion and installation of the extensive plant for the gun-factory have somewhat exceeded the original estimate, and a further appropriation of \$145,000 is asked for. The importance of this work justifies the expense, and it is believed that when the plant is completed, the United States will have a gun-factory as well equipped and as efficient as any in the world.

#### NAMING, RATING, AND COMMAND OF VESSELS.

The laws relating to the naming, rating, and command of vessels (Revised Statutes, sections 1529-1531) should be amended to conform to modern conditions. The classification in the statutes relates to the types of thirty years ago, and not only does not apply, but is impossible of application, to modern ships. According to section 1530, which prescribes the ratings, steam-ships of forty guns or more are classed as first-rates; those of twenty guns and under forty, as second rates; and all those of less than twenty guns, as third rates. We have not now, nor are we likely ever to have, a first-rate ship, as described by the statute, and it is doubtful whether such a vessel can be said to exist in any of the navies of the world. The only classification which can properly be applied at the present day is that made on the basis of displacement.

The law limiting details for command to certain specified grades is also unsuited to the conditions now prevailing. It is therefore recommended that the law be repealed and that the war ships of the Navy, of whatever type, be hereafter classified as follows: First class, of 5,000 tons displacement and over; second class, of 3,000 or more and below 5,000; third class, of 1,000 or more and below 3,000; fourth class, under 1,000 tons.

It is recommended that the following rule be adopted for the naming of vessels:

Battle-ships, after the States of the Union; cruisers, after the cities; coast defenders, armored, after important events or names connected with the history of the United States; coast defenders, unarmored, after rivers of the Union. Vessels of special classes should be given names appropriate to the service for which they are intended.

#### SHIPS IN COMMISSION.

The North Atlantic Squadron is commanded by Rear-Admiral Bancroft Gherardi, who succeeded Rear-Admiral S. B. Luce February 13. The squadron at present consists of the *Galena*, *Kearsarge*, *Dolphin*, and

*Yantic*, the *Atlanta* having for a short time been employed with it, the *Pensacola* having been detached for other duty, and the *Ossipee* put out of commission. The *Kearsarge* was detailed to this squadron upon her return from the South Atlantic Station, with the crew of the *Tallapoosa*. The *Yantic* recently sailed for the West Indies, conveying Lieutenant Norris and party, who will be engaged in the telegraphic determination of longitudes.

Owing to the unsettled condition of affairs upon the Isthmus, and to the Haytian revolution, these vessels have been stationed during most of the year in West Indian waters. Their presence at Port-au-Prince upon several occasions brought about a prompt and equitable arrangement of misunderstandings which might otherwise have resulted in long and tedious controversies, the principal of these occasions being the seizure of the steamers *Haytian Republic* and *Ozama* for alleged violation of the blockade. The negotiations which resulted in the release of the vessels reflected credit upon the officers concerned.

A riot having been reported on the guano island of Navassa, where the Navassa Phosphate Company, an American concern, is operating, the flag-ship *Galena* was dispatched to that place and secured nine of the alleged ringleaders, who were brought to Baltimore and turned over to the Federal authorities.

The *Pensacola* sailed in October for St. Paul de Loando, on the west coast of Africa, taking out the expedition for the observation of the total eclipse of the sun, December 22, 1889, in pursuance of the act of March 2, 1889.

The Department having been advised that three men had been left by the American schooner *Anna* on the uninhabited island of Arenas Cay, and were likely to perish by starvation, the *Ossipee* was sent there and rescued the two survivors.

The *South Atlantic Squadron* continues under the command of Acting Rear-Admiral James H. Gillis, and consists of the flag-ship *Richmond* and the *Tallapoosa*, the former having been assigned to this station within the year. The *Scatara* was detached and ordered to the Asiatic Station via Madagascar, where she assisted in procuring the arrest and trial of the master of an American schooner, who was charged with the murder of the U. S. consular agent at Andakabé.

The *Alliance*, having completed her cruise, was detached, ordered home, and put out of commission.

The *Asiatic Squadron* is commanded by Rear-Admiral George E. Belknap, who assumed command April 4, his predecessor, Rear-Admiral Ralph Chandler, having died suddenly at Hong-Kong, February 11. The vessels composing the squadron are the flag-ship *Omaha*, the *Marion*, *Monocacy*, *Palos*, and *Scatara*, the *Essex* having returned home upon completing her commission.

The *Pacific Squadron* continues under the command of Rear-Admiral L. A. Kimberly, and consists of the *Mohican*, the *Adams*, *Alert*, *Nipsic*,

*Pinta*, *Iroquois*, and the store-ship *Monongahela*. The *Trenton* and *Vandalia* were wrecked in the harbor of Apia on the 16th of March. The *Nipsic* was beached at the same time, but afterwards got afloat, and although she had lost her rudder and smoke-pipe, and was otherwise badly injured, she was repaired and fitted for the voyage to Honolulu. Here permanent repairs were made and the ship rendered fit to continue her cruise. Much property was saved from the wrecked ships by their crews, who were thus given occupation until they could return to San Francisco. The correspondence relating to the disaster at Samoa will be found in the Appendix.

The political uneasiness in the Hawaiian Islands renders the presence of a ship at Honolulu a necessary precaution, and one has therefore been kept at that point.

The *European Squadron* was under the command of Acting Rear-Admiral James A. Greer until the 24th of June, when he was ordered home. The *Lancaster* and the *Quinnebaug* were detached upon the completion of their commissions, leaving the *Enterprise*, under Commander B. H. McCalla, the only vessel on the station. The *Enterprise* was temporarily employed on the east coast of Africa, to investigate the case of the American schooner *Solitaire*, alleged to have been engaged in the slave trade, and to protect the lives and property of American citizens upon that coast, which were thought to be in danger from the natives.

*Squadron of evolution*.—The completion of a sufficient number of new ships enables the Department to form a squadron of evolution. The squadron, composed of the *Chicago*, *Boston*, *Atlanta*, and *Yorktown*, sailed from New York November 18, for Europe, under the command of Acting Rear-Admiral John G. Walker, and with the addition of the *Enterprise* will constitute the United States naval force on that station.

The *Training Squadron* consists of the *Jamestown* and *Portsmouth*, both of which have made the usual summer cruise, the latter having also made a cruise to the West Indies last winter. The *Saratoga* has been thoroughly refitted, in pursuance of the acts of June 20, 1874, and July 26, 1886, and turned over to the State of Pennsylvania for use as a nautical school ship at Philadelphia. •

*Special and detached service*.—The *Despatch*, *Ranger*, *Michigan*, and the *Thetis* continue on the same service as during last year. The *Thetis* has made a cruise to the Arctic, rescuing three of the survivors of the American whaling bark *Little Ohio*, and one of the crew of the bark *Ohio Second*, the former wrecked on Point Hope on October 3, 1888, and the latter at Nanwak Island, Behring Sea, on June 6, 1889.

#### DISASTER AT SAMOA.

The severest disaster which has befallen the Navy in recent years took place at Apia, Samoa, on the 16th of March, 1889. During a hurricane on that date, two vessels, the *Trenton* and *Vandalia*, were totally

wrecked, and the *Nipsic* was run on shore to save her from destruction. Capt. C. M. Schoonmaker, Paymaster F. H. Arms, Lieut. F. E. Sutton, U. S. Marine Corps, and Paymaster's Clerk John Roche, and 46 enlisted men lost their lives in the performance of duty. The report of Rear-Admiral Kimberly, commanding the Pacific station, shows that nothing that skill or experience could suggest was left undone to avert the catastrophe, but the vessels, with old-fashioned engines and defective steam-power, were wholly unable to withstand the fury of the hurricane. The loss of the *Trenton* and *Vandalia*, two of the best of the old wooden fleet, is a serious blow to the Navy in its present condition. They were abandoned on the 7th of July, after much of their armament and equipment had been saved. The *Nipsic* proceeded to the Sandwich Islands, where she has since been repaired and fitted for active service. The escape of the British ship *Calliope*, by steaming out to sea in safety during the hurricane, illustrates the value of high-power engines in war vessels.

The gallantry and fortitude displayed by Rear-Admiral Kimberly, his officers and men, at the time of the disaster, were such as to call forth the warmest commendations of the Department.

The natives of Samoa rendered valuable assistance in the rescue of life and saving of property, and their efforts have been suitably rewarded. Much suffering was caused among them by the destruction of their crops by the storm, and Rear-Admiral Kimberly was authorized to issue rations to them from the store-ship *Monongahela*, then at Pago Pago.

The Department authorized the charter of a steamer in Australia to convey the survivors to San Francisco, where they arrived on the 20th of May, with the exception of a few officers and men who were detained at Apia to look after American interests until the arrival of another vessel.

The heavy expense involved in the transportation home of the wrecked crews, amounting to about \$50,000, should be made the subject of a special appropriation, instead of being charged as a deficiency against the miscellaneous and contingent funds.

#### NAVAL WAR COLLEGE.

Recent legislation and administrative regulation have so complicated the situation of the Naval War College at Newport, R. I., that the Department does not feel justified in undertaking the construction of the building authorized March 2, 1889, until Congress shall have expressed itself more definitely on the question of site.

The Department feels no doubt, however, as to what that site should be. Goat Island has a restricted space, which is already sufficiently taken up. The Navy has only a right of temporary occupation on the island, which may determine at any time. Under these circumstances, it is recommended that no additional buildings be placed there. On

the other hand, Coaster's Harbor offers an excellent site, with abundance of room, and it can be reached by land. It belongs to the Navy, and it should ultimately be the headquarters of all the consolidated naval establishments at Newport.

The present condition of things, in which the college is made a sort of appendage to the Torpedo Station, under the Bureau of Ordnance, should be corrected. It is attaching the greater to the less. The work of the Bureau of Ordnance has no connection with that of the War College, and no reason can be assigned for placing the college under that Bureau. Torpedo instruction should be a part of the training given in the science of war, but the school at which this training is undertaken should not be a torpedo school with a subsidiary course in naval strategy. Ultimately, all the educational establishments at Newport should be placed under a single officer, and the consolidated establishment, like all others pertaining to education, should be under the Bureau of Navigation.

For the present, the Department has only to recommend that the building for which appropriation was made at the last session be placed on Coaster's Harbor, and that the appropriation be made under the head of "Bureau of Navigation."

The War College is unquestionably one of the most important institutions connected with the Navy. Its establishment, in 1884, represented a marked advance in naval development. Its work, even in the restricted sphere to which it has hitherto been confined, has been of immense benefit to the service, and it is of the highest importance that nothing should be done that will in any way interfere with its efficiency.

#### ORGANIZATION OF THE DEPARTMENT.

Under the authority conferred by section 419 of the Revised Statutes, which provides that "the business of the Department of the Navy shall be distributed, in such manner as the Secretary of the Navy shall judge to be proper and expedient, among the following bureaus: First, a Bureau of Yards and Docks," etc., I judged it proper and expedient to distribute anew certain branches of Navy Department business among the bureaus, and to that end issued a general order June 25, 1889, which order has subsequently undergone certain slight modifications.

At the time of my entry into office, and until the date of this order, the Navy Department, while it had the supervision of eight bureaus charged with special branches of manufacture or of supply of materials, contained no single office upon which devolved the detailed administration of the working establishment. The details of construction of ships and engines, of accounts, of the care of health, of the manufacture of guns and other articles of equipment were fairly provided for, but the details of administering the Navy, as an existing force, its vessels in commission, its officers and its crews, were scattered, without system

or coherence, among a variety of offices, bureaus, and boards. The assignment of officers to duty and, to a limited extent, the movements of ships in commission, were in charge of an "office of detail," at the head of which was the chief of the Bureau of Navigation, which Bureau was at the same time supplying compasses, chronometers, and navigating instruments, electric-light plant, ship's libraries, and other miscellaneous articles. The enlistment and assignment of seamen belonged to Equipment, which was also engaged in the supply of another list of miscellaneous articles, and in the manufacture of cordage, galleys, chains, and anchors. The direction of gunnery practice by ships in commission was in charge of Ordnance, whose all-important duties in providing the Navy with a modern armament left little opportunity for supervising the occupations of vessels at sea. The examination of these vessels on their return from a cruise was the duty of a board of inspection which was not associated with any bureau. The training of officers and men was in part conducted independently by the Naval Academy, and in other parts assumed by Navigation, Equipment, and Ordnance. To all these fragments of authority there was no central unity of direction, except such as could be given by the personal attention of the Secretary, to the exclusion of that broad and general supervision over all executive business which is required by a department as comprehensive as the Navy; and cases were not infrequent where a ship received simultaneous orders from three separate bureaus which were so directly contradictory that it was impossible to execute them.

With the obsolete vessels that until recently composed the whole naval establishment, the need of reform was not so apparent, since no mere system of administration could secure efficiency in a worthless fleet; and in view of the coming reconstruction of ships and armaments, any new regulations would be largely provisional. For this reason, the main effort of the Department for some time past has wisely been directed to supplying its most pressing wants. With the acquisition of modern ships and guns, however, as was pointed out by my predecessor, reform became an administrative necessity.

The plan adopted is that which would be dictated by common sense in the management of any business concern, namely, to put the details of the working establishment in one office, and to separate from that office the details of construction, manufacture, and supply. The fleet, including vessels, officers, and seamen—training, assignment, enlistment, inspection, and practice—falls under the Bureau of Navigation, while miscellaneous branches of equipment, and the supervision of subordinate offices connected therewith, or engaged in investigations not pertaining to administration proper, fall under the Bureau of Equipment. The Hydrographic Office, which would naturally be grouped under the latter class, is placed by the statute under the Bureau of Navigation, with which it has no logical connection, and it is therefore recommended that the law (section 431, Revised Statutes) be so amended

as to admit of its transfer to the Bureau of Equipment. Incidentally, the order also included the consolidation of branches of similar work which had grown up in different bureaus. Thus, electric lighting in general was under Navigation, and the supply of electric search-lights under Ordnance—a manifest absurdity, which has been corrected by placing all electric lighting where it properly belongs, under Equipment. The change has already produced the most beneficial results, and only requires this slight modification of existing law in reference to the Hydrographic Office to become a complete and homogeneous system.

Another change of equal importance was made by this order. As already suggested, the work of the Navy Department for some time to come must consist largely in the design and construction of modern vessels. Upon assuming charge of the Department I found that this work, so important, so complex, and involving such heavy expenditure, was conducted in much the same manner as the management of the working establishment—by separate bureaus acting independently and with no unity of direction except what was given by the Secretary himself. In the old days of sailing ships the constructor was rightly placed in charge of the whole vessel, for he built the whole vessel. There were no engines, and the battery had no influence upon the construction of the ship otherwise than as an article of heavy furniture. Now the constructor builds only the hull. The vital forces of the ship are given to her by the engineer. The hull can not be built until a definite conclusion has been arrived at as to the weight and disposition of the machinery, and that in turn, as well as the design of the hull, must be considered with reference to the weight and disposition of the guns. To attempt to reach a conclusion by means of three co-ordinate bureaus working independently, without unity of direction, and without any established organization by which differences may be harmonized and an agreement reached, must produce delay, confusion, changes of plan, and additional expense.

To remedy this serious defect the only plan which the law admitted was adopted; and it was provided in General Order No. 372 that the chiefs of the Bureaus of Yards and Docks, Ordnance, Equipment, Construction, and Steam Engineering should constitute a board having general supervision over the designing, constructing, and equipping of new ships for the Navy. The order brings together for consultation all the chiefs of bureaus who are concerned in the design and construction of the ship, her engines, battery, and equipment. The general plan of such designs must be agreed upon and a harmonious conclusion thus arrived at by all the independent agencies concerned before the detailed work is undertaken. Responsibility for delay can be placed at once where it belongs. It is not possible to say any longer that one bureau is waiting for another to reach a conclusion. Conclusions must be reached, and promptly reached, by the board.



In this connection I would suggest the propriety of a change in the name of the Bureau of Provisions and Clothing, which designation represents very imperfectly the functions of the Bureau. It might properly be called the "Bureau of Supplies and Disbursements." The words "and Recruiting" should also be dropped from the designation of the Bureau of Equipment and Recruiting.

It is recommended that authority be given for the appointment of assistants to all chiefs of Bureaus, in the manner now provided for the Bureau of Medicine and Surgery (Rev. Stat., sec. 1375).

The reports of the Bureaus, and of the Naval Academy, Naval Observatory, and Hydrographic Office, annexed hereto, will be found to contain many important and valuable suggestions.

#### ESTIMATES AND APPROPRIATIONS.

As was predicted by the Secretary in the annual report for 1883, the policy adopted at that time of discontinuing repairs on the old wooden vessels, and removing them gradually from the list, has brought about a material reduction in the ordinary expenses of the Bureaus of Construction and Repair, Steam Engineering, and Equipment. The extent of this reduction is reported by my predecessor. In furtherance of the policy of retrenchment thus initiated, it has been found possible to reduce the estimates for the support of the naval establishment, which are transmitted herewith, \$1,168,023.95 below those presented by the Department last year.

As appears from the report of the Bureau of Equipment, the general appropriation of that Bureau was practically exhausted on the 1st of March last. All work on equipment of vessels fitting out was therefore stopped, and a large proportion of requisitions for necessary supplies was disapproved, great embarrassment to the service resulting. Notwithstanding these retrenchments, the necessary expenditures, many of which, being for vessels on foreign stations, were beyond the control of the Department, resulted in a deficiency of over \$100,000.

The practice of appropriating an amount too small to keep up the work of the Department, and then working off in advance the appropriations of the next year by a provision in the annual bill that they "shall be immediately available" to cover deficiencies in the current year, will place the Department under the disagreeable necessity of asking for a new deficiency appropriation before the year is ended. The general appropriation for the Bureau of Construction, under the head of "Preservation and repair of vessels," for the year now current, was reduced in this manner \$150,000 before the year began, and it must therefore be supplemented by a new appropriation early in the session, unless the current work is to come to a stop.

A deficiency for the past fiscal year also exists in the appropriation, "Pay of the Navy," which is stated by the Fourth Auditor of the Treasury to have been "partially caused by the payment out of that fund

of claims settled, under recent decisions of the Supreme Court, for longevity and for service on board receiving-ships."

There will also be a small deficiency in the appropriation "Pay miscellaneous, 1889," due to the causes which produced a similar deficiency last year, and which were thus explained by my predecessor in his annual report:

The expenditures under this head of appropriation can not always be controlled and kept within the amount specifically appropriated, as from it are paid all traveling expenses of officers or others on public duty, and the travel performed is dependent upon the necessities and requirements of the service.

The Department would call attention to the disadvantages of limiting, by act of Congress, the cost of vessels of specified requirements. It may be suitable in theory, but it works badly in practice. The sum named is necessarily conjectural to a large extent, and may be wide of the mark. After the type has been decided on, some particular feature of the design, involving a small excess over the limit, may make the difference between the efficiency and the inefficiency of the ship. An improvement not in itself expensive, yet which may be enough to turn a second-rate into a first-rate ship, may thus be prevented by the fixing of a limit. If the limit is too high it draws bidders up to it, if too low it postpones the contract to the next session of Congress. The construction of the *Newark* was delayed a year and a half pending a reference to Congress for an increased limit. More recently, in the case of the two 3,000-ton cruisers (Nos. 7 and 8) the cost had been limited to \$1,100,000, and the act authorizing them required that they should develop a speed of 19 knots. The lowest bid was \$125,000 in excess of the prescribed limit, and the Department being thus compelled to delay the work, or to do it in the navy-yards, adopted the latter alternative. It is therefore desirable that the act should appropriate for a certain number of ships, and indicate their type and general characteristics, leaving the Department to award contracts to the lowest responsible bidder.

In considering the economical administration of the Navy Department, a distinction must be drawn between the fixed charges, such as the pay of the Navy and Marine Corps, the charges for improvements authorized by statute, and the running expenses. The first are practically outside of departmental control. The second class includes appropriations based to a certain extent upon the Department's recommendations, but fixed in amount by Congressional action, prescribing certain specific works. These are the appropriations for the increase of the Navy, which are kept distinct from all others. A similar distinction, which has not hitherto been very carefully made, should set apart the expenses for permanent improvements at the navy-yards, and put them under this head. The third class includes the ordinary expenses of the eight bureaus and the miscellaneous and contingent funds. It is in this class, amounting to something like five millions a year, that careful administration is most necessary to secure economical results.

In the last class of charges, most of which are under the detailed administration of the bureaus, the Department intends to limit expenditures to the actual necessities of an efficient navy; but it believes that a navy, to be efficient, must be, to a reasonable extent, in a condition of readiness for war. The reduction in expenditure which followed the adoption of a fixed limit of repairs on wooden vessels may be maintained, in nearly all directions, until the wear and tear of service shall make repairs necessary to the new fleet, which it is to be hoped will not be for some time to come. On the other hand, one important item, that of coal, will necessarily show a large increase, as many of the new ships have little or no sail power, and all will be heavy coal consumers. This is a drain that must be met. A modern navy requires fuel no less than a railroad. It is the life of the cruising ship, and the cruising ships are the life of the whole establishment. Without a considerable increase, and that at no distant day, in the supply of coal, the new navy will stop running.

The following is an exhibit of the estimates of the Department proper and the several bureaus:

Department proper:

Pay of the Navy .....	\$7, 656, 312. 00	
Pay, miscellaneous .....	240, 000. 00	
Contingent, Navy .....	7, 000. 00	
		<hr/>
		\$7, 903, 312. 00

Bureau of Yards and Docks..... 1, 796, 836. 32

Bureau of Navigation:

Proper .....	\$164, 900. 00	
Naval Academy .....	281, 617. 45	
		<hr/>
		446, 517. 45

Bureau of Equipment and Recruiting..... 1, 128, 625. 00

Bureau of Ordnance:

Proper .....	\$279, 224. 00	
Increase of the Navy .....	3, 971, 500. 00	
Gun plant, Washington navy-yard .....	145, 000. 00	
Submarine torpedo-boat .....	150, 000. 00	
		<hr/>
		4, 545, 724. 00

Bureau of Construction and Repair:

Proper .....	\$1, 194, 972. 50	
Increase of Navy .....	4, 000, 000. 00	
		<hr/>
		5, 194, 972. 50

Bureau of Steam Engineering:

Proper .....	\$1, 000, 070. 00	
Increase of Navy .....	1, 120, 000. 00	
		<hr/>
		2, 120, 070. 00

Bureau of Provisions and Clothing..... 1, 350, 392. 53

Bureau of Medicine and Surgery..... 159, 500. 00

Marine Corps:

Pay department .....	\$697, 492. 27	
Quartermaster's department .....	255, 811. 72	
		<hr/>
		953, 303. 99

**Total..... 25, 599, 253. 79**

## REPORT OF THE SECRETARY OF THE NAVY.

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## APPROPRIATIONS, EXPENDITURES, AND BALANCES, FISCAL YEAR ENDING JUNE 30, 1889.

Heads of appropriation.	Appropriations for fiscal year ending June 30, 1889.	Amount drawn, fiscal year ending June 30, 1889.	Balances undrawn, June 30, 1889.	Balances undrawn Octo- ber 31, 1889.
Pay of the Navy.....	\$7,082,404.00	\$5,515,376.09	\$1,567,027.91	\$715,878.10
Pay, miscellaneous.....	215,000.00	205,493.02	9,506.98	9,726.24
Contingent, Navy.....	7,000.00	1,954.38	5,045.62	4,933.53
Pay of the Marine Corps.....	673,807.66	561,274.42	112,533.24	54,261.41
Marine Corps:				
Provisions.....	62,185.05	59,691.55	2,493.50	244.12
Clothing.....	65,000.00	65,000.00	-----	911.48
Fuel.....	18,000.00	17,943.00	57.00	-----
Military stores.....	10,786.50	10,732.50	54.00	53.08
Transportation and recruiting...	12,500.00	12,214.60	285.40	199.50
Repairs of barracks.....	10,780.00	10,770.00	10.00	.20
Hire of quarters.....	6,560.00	6,500.00	-----	49.97
Forage.....	3,500.00	3,500.00	-----	7.10
Contingent.....	26,322.02	25,980.69	341.33	261.48
Pay, Naval Academy.....	104,013.45	103,700.00	313.45	1,261.67
Naval Academy:				
Special course.....	5,000.00	3,136.30	1,863.70	1,447.79
Repairs.....	21,000.00	14,614.91	6,385.09	2,551.08
Heating and lighting.....	17,000.00	16,406.20	593.80	20.27
Stationery.....	2,000.00	1,881.48	118.52	-----
Library.....	2,000.00	1,570.43	429.57	221.79
Chemistry.....	2,500.00	2,325.51	174.49	19.24
Stores.....	800.00	776.23	23.77	11.14
Materials.....	1,000.00	959.58	40.42	10.52
Board of visitors.....	1,500.00	1,500.00	-----	26.84
Miscellaneous.....	32,000.00	29,410.69	2,589.31	13.46
Navigation and navigation supplies	90,000.00	84,364.32	5,635.68	315.16
Civil establishment, navigation.....	9,360.00	9,231.24	68.76	68.76
Contingent navigation.....	5,000.00	2,771.55	2,228.45	1,404.19
Naval War College.....	10,000.00	5,558.29	4,441.71	4,391.90
Ordnance and ordnance stores.....	253,000.00	233,057.61	19,942.39	9,476.03
Ordnance:				
Repairs.....	15,000.00	11,900.66	3,099.34	2,262.44
Civil establishment.....	24,525.00	23,847.54	677.46	667.63
Contingent.....	5,000.00	4,021.38	978.62	-----
Torpedo Corps.....	65,700.00	47,555.96	18,144.04	2,065.75
Equipment of vessels.....	625,000.00	535,551.77	89,448.23	100,360.45
Equipment and recruiting:				
Transportation and recruiting...	30,000.00	28,373.23	1,626.77	655.91
Civil establishment.....	11,525.00	11,426.21	98.79	227.03
Contingent.....	15,000.00	8,156.08	6,843.92	1,844.35
Naval training station, Coaster's				
Harbor Island, R. I.....	14,000.00	10,550.24	3,449.76	487.51
Maintenance, yards and docks.....	165,000.00	150,152.84	14,847.16	1,599.81
Yards and Docks:				
Civil establishment.....	46,580.70	45,111.34	1,469.36	1,540.77
Contingent.....	20,000.00	19,087.16	912.84	7.39
Repairs and preservation at navy-				
yards.....	300,000.00	271,383.13	28,616.87	10,412.50
Naval Asylum, Philadelphia, Pa....	82,367.00	46,256.95	36,110.05	14,009.55
Medical Department.....	57,500.00	54,397.73	3,102.27	8.89
Naval Hospital fund.....	20,000.00	20,000.00	-----	-----

## APPROPRIATIONS, EXPENDITURES, AND BALANCES, ETC.—Continued.

Heads of appropriation.	Appropriations for fiscal year ending June 30, 1889.	Amount drawn, fiscal year ending June 30, 1889.	Balances undrawn, June 30, 1889.	Balances undrawn Octo- ber 31, 1889.
<b>Medicine and Surgery :</b>				
Repairs.....	\$25,000.00	\$16,411.14	\$8,588.86	\$2,290.51
Contingent.....	25,000.00	19,331.60	5,668.40	.....
Provisions, Navy.....	1,066,900.00	681,218.17	384,781.83	10,785.24
<b>Provisions and Clothing :</b>				
Civil establishment.....	67,287.56	65,510.39	1,777.17	2,611.45
Contingent.....	30,000.00	27,340.90	2,659.10	301.96
<b>Construction and Repair.....</b>	<b>825,000.00</b>	<b>754,265.99</b>	<b>70,734.01</b>	<b>41,205.73</b>
Civil establishment, construction and repair.....	20,162.01	19,924.95	237.06	558.59
Steam machinery.....	605,000.00	540,505.78	64,494.22	25,262.67
<b>Steam Engineering :</b>				
Civil establishment.....	17,018.63	16,923.13	95.50	357.84
Contingent.....	1,000.00	844.71	155.29	65.04
	12,928,624.58	10,437,902.57	2,490,722.01	1,027,344.06

As will be seen from the foregoing exhibit—

The amount of appropriations for the fiscal year 1889, including \$2,500 by appropriation warrant No. 10, for transportation and recruiting Marine Corps, 1889; also \$117,000, which was by appropriation warrant No. 13 transferred from ordnance and ordnance stores of said year; \$12,000 to "ammunition for the <i>Vesuvius</i> " and \$105,000 to "modern guns and ammunition," was.....		\$12,928,624.58
Drawn by requisition to June 30, 1889 .....		10,437,902.57
Balance undrawn July 1, 1889.....		2,490,722.01
In hands of disbursing officers, June 30, 1889.....		307,034.37
		2,797,756.38
Drawn by requisition from July 1 to October 31, 1889 .....		1,463,377.95
		1,334,378.43
Drawn by requisition from November 1 to November 21, 1889.....		171,192.34
		1,163,186.09
Due from pay of the Navy to officers and men.....		\$680,482.19
Due from pay of the Marine Corps to officers and men...		47,200.64
		727,682.83
Available balance .....		435,503.26

This balance will be decreased by liabilities incurred during the fiscal year 1889.

## SALES OF GOVERNMENT PROPERTY AND VESSELS.

As will be seen from the detailed statement given in the appendix, the total amount deposited in the Treasury from November 1, 1888, to November 1, 1889, as receipts from the sale, at public auction, of condemned property pertaining to the Navy and Marine Corps, from sales

to other departments of the Government, from rents, interest, and premiums on exchange, was \$87,372.18, including \$16,000 proceeds of the sale of condemned vessels, which was covered into the Treasury by my predecessor. Of the total amount, \$27,835.06 were carried to the credit of the proper appropriations and \$59,537.12 covered into the Treasury in pursuance of law.

The sales at Norfolk in September last of old materials condemned by statutory board, under the provisions of the second section of the act of August 5, 1882, have not yet been reported, and are therefore not included in the above total. They will net about \$15,000.

No sales of old vessels have taken place during the year. In pursuance of the act of August 5, 1882, the *Juniata* and *Quinnebaug* have been stricken from the Navy Register as "unfit for further service," and in pursuance of the act of March 3, 1883, have been appraised. The sum of \$940.47, being the balance on hand of proceeds of sales of old vessels, transferred to me by check on my entry into office, has been covered into the Treasury.

The tug *Pilgrim* which was condemned and offered for sale in 1886, but for which no bids were made, was re-appraised July 6 last, and will shortly be re-advertised for sale.

Of the other wooden vessels the *Lancaster* has been recently surveyed and ordered to be repaired for use as a gunnery ship. The *Brooklyn* was also ordered to be repaired, but upon opening her up was found to be badly decayed, and a resurvey has been ordered which will probably result in her condemnation. The *Ossipee* has been surveyed, and as it will cost \$100,000 to repair her, including new boilers, it has been decided to remove the old boilers and use her as a sailing ship for the instruction of apprentices.

On the 1st of March last the Department had directed the sale of the *Monocacy*, in accordance with the recommendation of a board of survey. The sale was advertised to take place May 13. On May 7 the Department suspended the sale and ordered a resurvey. The board found the vessel was worth repairing, and that the repairs could be made at a reasonable cost. As a vessel of this class is indispensable for river service on the Asiatic station, and as the repairs, amounting to a little over \$10,000, would put her in condition for three years, the necessary order was issued, and the work is now completed.

The returns annexed to the report of the Paymaster-General show that the stock on hand at shore stations of articles belonging to the Navy June 30, 1889, amounted in value to \$16,486,885.24. The largest items in the list are: Guns and carriages, \$4,624,047.23; ammunition and explosives, \$2,292,120.05; oak timber, \$1,721,485.63; paints and chemicals, \$909,558.61, of which about \$800,000 is represented by a stock of niter acquired during or subsequent to the war for prudential reasons; gun equipment and implements, \$802,214.25; brass, copper, etc., \$541,070.69; chain, \$503,881.03.

These stores, which take up valuable space at navy-yards, and involve expense for preservation and custody, and a large part of which will never in any contingency be used, ought to be condemned under the act of August 5, 1882, section 2, not being such as "can be profitably used by re-working or otherwise in the construction or repair of vessels, their machinery, armor, armament, or equipment." The act requires that all such sales shall be at public auction, a method which is well adapted for small sales, but which gives opportunities for combinations of bidders against the Government, where the amounts involved are large. I recommend that this statute be amended so as to provide for sales in the discretion of the Secretary, either by public auction as at present, or by public advertisement inviting sealed proposals, in the manner now prescribed by law for sales of condemned vessels.

A copy of the statement of the Fourth Auditor particularizing the several deposits on account of sales during the year will be found in the appendix.

#### MARINE CORPS.

The report of Col. C. G. McCawley, commandant of the Marine Corps, advocates an increase in the number of privates now appropriated for. The full strength of the force as prescribed by law is 2,500, but the appropriation allows only 1,600. This number is not large enough for the work to be done, and as a result the men are overtasked and desertions are frequent. An additional difficulty is caused by the insufficiency of the appropriations for transportation and recruiting, which makes it impossible to open recruiting offices in the interior, and thus to fill up the ranks of the corps. A small addition to the amounts allowed would correct these evils.

#### CENTENNIAL INTERNATIONAL EXHIBITION AT MELBOURNE.

At the request of the State Department, Lieut. Adolph Marix was detailed for duty at the Centennial International Exhibition at Melbourne, Victoria, as disbursing officer and secretary of the United States Commission. He also served as superintendent of the United States court at the exhibition, and from January 15 until the close of the exhibition, March 31, 1889, he was in charge of the Commission, the Commissioner having returned home. The services rendered by Lieutenant Marix are favorably referred to by the Commissioner.

#### THE REVENUE MARINE SERVICE.

The recommendation is made by the Board of Visitors at the Naval Academy, that the officers of the Revenue Marine Service should be taken from the graduates of the Academy. This suggestion is sound and timely, but does not go far enough. The extravagance of maintaining in the United States what are practically two navies, one for

ocean service and the other for coast service, supplied by two naval academies, one of which discharges half of its pupils at graduating, has at different times been pointed out, and nowhere more forcibly than in the reports of the Secretary of the Navy for 1882 and 1883. The report for 1882 says:

In the interests of economy the change suggested is desirable. While the Navy proper is being reduced the Government is keeping up a revenue navy of 34 captains, 86 lieutenants, and 65 engineers; in all, 185 officers. Two training-schools are maintained to do the work of one. The Naval Academy at Annapolis is supplied with a full corps of instructors, and every appliance for the training at all times of 335 naval cadets. At the same time, another school is maintained at New Bedford for the training of Revenue Marine cadets, covering the same ground, only in a limited degree, and with imperfect appliances. The Revenue Marine cadets receive \$900 a year during their service at the school.

Recent legislation has provided that only a part of each graduating class at Annapolis shall enter the Navy, while the remainder shall be given a year's pay, and remanded to private life. All these young men, upon whom the Government has bestowed a gratuitous education, are well fitted for their profession, from which they are thus excluded; and by opening the cruising cutter service to these graduates of the Naval Academy the Government will save, at a single stroke, the whole cost of a duplicate establishment.

The Department therefore strongly recommends a consolidation of the coast-guard navy and the ocean navy. It is believed that no practical difficulties lie in the way of its accomplishment. The present Revenue Marine, composed of some two hundred officers, should be taken bodily into the naval service and organized as a separate corps, to be known as the Revenue Marine Corps of the Navy, subject in all respects to the laws, and entitled to all the privileges which attach to the naval commission.

The interests of the existing Revenue Marine officers being thus carefully guarded, their employment and emoluments will continue as at the present time. As vacancies occur at the foot of the list they should be filled, not by special appointment, but by the temporary detail of junior naval officers, thereby diminishing the number of cadets discharged each year from the graduating class at the Academy. As the numbers of the Revenue Marine Corps decrease, the number of junior officers of the Navy employed on the duty would increase, until, in the course of time, the corps would pass away by the operation of natural causes, such as retirement, death, and resignation.

As to employment, the officers of the Revenue Marine Corps, as long as it lasted, and those of the Navy supplying the places made vacant in the corps, would perform the duties now incident to the Revenue Marine. The harbor boats now used by the inspectors of customs, which do not require a special corps of officers, should remain, as at present, exclusively under the customs service, as the light-house tenders are under the Light-House Board. The cruising cutters, however, should be officered and manned by a force fully incorporated in the naval organization.



The duties of the Navy and Revenue Marine are identical in general character, and differ only in their administrative objects. One polices the ocean, the other the coast. The seizure of smugglers, the only duty of the Revenue Marine that has direct relation with the collection of customs, is precisely similar to the duty of naval officers in seizing vessels engaged in contraband trade in time of war. Other duties of the Revenue Marine, such as the enforcement of the neutrality laws and the suppression of piracy and of mutinies in merchant vessels, are now actually imposed on and performed by the Navy in common with the sister service.

The rescue of distressed vessels and seamen on our coast is as much the duty of naval as of revenue officers, and the only reason why the former do not perform it is because they are not on the coast, or have no suitable vessels for the service. For the other miscellaneous duties of the Revenue Marine, such as the enforcement of the laws applicable to shipping, the prevention of unlawful traffic in fire-arms in Alaska, and the protection of the seal fisheries in Behring sea, naval officers are perfectly well fitted. Finally, in time of war both law and custom sanction the employment of the Revenue Marine in naval operations.

The practical identity of the services lies in the fact that both are nautical, and both are military. There is absolutely no reason for a distinction between them, and a consolidation would inure equally to the advantage of both; and it is believed that the officers of both services would regard the change with favor. The Revenue Marine would be placed on a substantial footing, absolutely the same as that of naval officers, and could not fail to find satisfaction in being connected with the past traditions and future development of the Navy. The junior naval officers, who would gradually obtain employment in the cutters, would find the service of great practical benefit, and the knowledge they would thus obtain of the pilotage of our own coasts and harbors would be an overwhelming advantage to the Government during their whole professional career. Finally, in the interests of a sound economy, the consolidation must sooner or later take place, and the sooner it comes the better it will be for the country, for the Navy, and for the Revenue Marine.

It is now eight years since the Navy entered upon its present course of development. The sixteen years that preceded this period were marked by the reaction and relaxation that naturally follow a costly and hard-fought war. The turning-point was reached with the beginning of the year 1882, and it is now possible to estimate at their true value the successive steps by which this eight years' development has been accomplished. The first was the rigorous limitation of repairs on the old wooden ships to a small fraction of their cost, and the removal from the list of those that could not be made serviceable within the limit. Without this bold and judicious measure the new navy would not yet have been commenced. The construction of efficient cruisers fol-

lowed at once. The closing of unnecessary yards and the concentration of work at those remaining in operation was another act of retrenchment which opened the way for a more profitable outlay. Out of it has grown the Washington naval gun-factory, a working establishment second in its way to no other in the world.

The investigations of the Gun Foundry Board of 1883-'84, of the Board of Fortifications of 1885-'86, and of the special committees of the Senate and House, combined with the efforts of the Department and the manufacturers, contributed to the same result, and brought about the domestication in the United States of the manufacture of steel armor and gun-forgings, and of machine and rapid-firing guns. The Bureau of Ordnance, in whose work these converging influences united, has now begun the supply of high-power cannon of its own design and make, which are fully equal to similar guns abroad. The construction of war ships has been continued successfully, the designs increasing in efficiency with every advance in the science of naval architecture.

A like progress has been made in naval administration. The establishment of the Office of Naval Intelligence and the employment of trained observers abroad in connection with it; the foundation of the War College, which has developed the study of problems of modern warfare in a manner at once scientific and practical; the consolidation of stores and accounts; and, it may be hoped, the introduction of unity of administration into the management of the fleet and of unity of purpose into the bureaus concerned in ship design, armament, engineering, and equipment, are important steps in the direction of reform. To these measures Congress, the Department, and, by no means least, the professional talent of the service itself, have all contributed. It is a work in which both the administrations covering the period have had their share, and the citizens of this country should congratulate themselves that its political parties, instead of attempting to detract from and belittle each other's contributions to naval development, are engaged only in a generous rivalry to see which can do the Navy the most good.

Notwithstanding the progress of the last eight years, it must not be forgotten that the fleet has still only a nominal existence. During the past year four ships have been added to the list, and seven have been or will shortly be removed. At no previous time in the present century has the country been relatively so powerless at sea. The wooden ships are a makeshift, and will soon cease to be even that. The old monitors are worse than useless. The force actually available at the present time comprises eight modern vessels, of no great fighting power because of their weakness for defense. The main force has yet to be authorized. Until the United States has a fleet of twenty battle-ships with coast-defenders, cruisers, and torpedo-boats in suitable proportions for efficient defense, and an establishment in such working order, as to administrative machinery, officers, men, reserves, and vessels, that it can be brought without delay into effective action, the country can not

consider that it possesses a Navy ; and a Navy it can never afford to be without.

The true principle for us to follow is that laid down by President John Adams in his message of 1800, when he said: " Seasonable and systematic arrangements, so far as our resources will justify, for a Navy adapted to defensive war, which may in case of necessity be quickly brought into use, seem to be as much recommended by a wise and true economy as by a just regard for our future tranquillity, for the safety of our shores, and for the protection of our property committed to the ocean."

B. F. TRACY,  
*Secretary of the Navy.*

## APPENDIX.

### NO. 1.—ESTIMATES, CONTRACTS, ETC., SECRETARY'S OFFICE.

*Estimates of appropriations required for the service of the fiscal year ending June 30, 1891,  
by the Navy Department.*

Detailed objects of expenditure, and explanations.	Estimated amount which will be re- quired for each detailed object of expenditure.	Total amount to be appropriated under each head of appropriation	Amount appropriated for the current fiscal year ending June 30, 1890.
<b>SALARIES, OFFICE OF SECRETARY OF THE NAVY.</b>			
Secretary (February 28, 1889) .....	\$8,000		
Chief clerk, Navy Department (same act) .....	2,500		
Clerk to the Secretary (submitted) .....	2,250		
Disbursing clerk (February 28, 1889) .....	2,250		
One clerk of class four, in charge of files and records (same act) .....	1,800		
Two clerks of class four (same act) .....	3,600		
One stenographer (same act) .....	1,600		
Two clerks of class three (one additional, in lieu of one clerk of class two dropped) (same act) .....	3,200		
One clerk of class two for Inspection Board (same act) ....	1,400		
One clerk of class two, one dropped as above, and one ad- ditional (in lieu of one of class one dropped) (same act) ..	1,400		
Four clerks of class one, one dropped as above, and one transferred from Office of Judge Advocate General (same act) .....	4,800		
One clerk of class one for Examining and Retiring Board (same act) .....	1,200		
One clerk (same act) .....	1,000		
One telegraph operator (increase of \$200, submitted) (same act) .....	1,200		
One carpenter (increase of \$100, submitted) (same act) ....	1,000		
Three messengers, at \$840 each (one additional, in lieu of one assistant messenger dropped) (same act) .....	2,520		
Two assistant messengers, at \$720 each, one dropped as above (same act) .....	1,440		
Two messenger boys, at \$420 each (same act) .....	840		
One messenger boy (increase of \$120, submitted) (same act) ..	360		
One laborer (same act) .....	660		
One laborer for Inspection Board of Vessels (same act) .....	660		
One laborer for Steel Inspection Board (submitted) .....	660		
		\$44,340	\$51,660
<b>NOTE.</b> —The following clerks, appropriated for the Secretary's office for the current fiscal year, have been transferred and estimated for under other bureaus for the next fiscal year: Three clerks of class four to Bureau of Navigation; two clerks of class three to Bureau of Navigation; two clerks of class two, one to Bureau of Navigation, one to Office of Judge Advocate General; one clerk at \$1,000 per annum to Bureau of Navigation.			
<b>CONTINGENT EXPENSES, NAVY DEPARTMENT.</b>			
Stationery furniture, newspapers, plans, drawings, drawing materials, horses, carriages, freight, expressage, postage, and other absolutely necessary expenses of the Navy Department and its various bureaus and offices. (Appropriated February 28, 1889) .....		18,000	12,000
<b>NOTE.</b> —This estimate is proportioned as follows: Office of the Secretary of the Navy, including the office of the Judge Advocate General .....			
Bureau of Ordnance .....	\$6,000		
	1,000		

*Estimates of appropriations required for the service of the fiscal year, etc.—Continued.*

Detailed objects of expenditure, and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Total amount to be appropriated under each head of appropriation	Amount appropriated for the current fiscal year ending June 30, 1890.
<b>CONTINGENT EXPENSES, NAVY DEPARTMENT—continued.</b>			
Bureau of Yards and Docks.....	\$750		
Bureau of Provisions and Clothing.....	1,800		
Bureau of Construction and Repair.....	1,000		
Bureau of Steam Engineering.....	800		
Bureau of Medicine and Surgery.....	300		
Bureau of Navigation, including the Hydrographic Office, Navy Department library, office of Naval War Records, and office of Naval Intelligence....	5,350		
Bureau of Equipment and Recruiting, including the Nautical Almanac office, Compass office, and office of Inspector of Electric Lighting.....	1,200		
<p>The reconstruction of the Navy necessarily affects almost every bureau and office of the Navy Department, and creates additional demands upon the contingent fund. An increase of employes involves additional outlay for furniture, stationery, and other items of a contingent nature. The appropriations heretofore for this purpose have been totally inadequate, not meeting pressing needs.</p>			
<b>PAY OF THE NAVY.</b>			
For the pay of officers on sea duty; officers shore and other duty; officers on waiting orders; officers on the retired-list; Admiral's and Vice-Admiral's secretaries; clerks to commandants of yards and stations; clerks to paymasters at yards and stations; inspections; receiving-ships and other vessels; extra pay to men re-enlisting under honorable discharge; pay of petty officers, seamen, landsmen, and boys, including men in the engineers' force, and for the Coast-Survey Service and Fish Commission, 7,500 men and 750 boys, at the pay prescribed by law (March 2, 1889).....	\$7,656,312		\$7,250,000
<p>NOTE.—The foregoing estimate is made up as follows:</p>			
Pay of 1,615 officers on the active-list.....	\$3,466,250		
Pay of 270 naval cadets under instruction.....	135,000		
Pay of 346 officers on the retired-list.....	801,762		
Pay of 2 secretaries and 92 clerks.....	121,300		
Pay of petty officers, seamen, landsmen, and boys.....	3,000,000		
Extra pay of petty officers and seamen re-enlisting under honorable discharge (1,200, at an average of \$110).....	132,000		
Total.....	7,656,312		
<b>PAY, MISCELLANEOUS.</b>			
<p>For commissions and interest; transportation of funds; exchange; mileage to officers while traveling under orders in the United States, and for actual personal expenses of officers while traveling abroad under orders, and for traveling expenses of apothecaries, yeomen, and civilian employes, and for actual and necessary traveling expenses of naval cadets while proceeding from their homes to the Naval Academy for examination and appointment as cadets; for rent and furniture of buildings and offices not in navy-yards; expenses of courts-martial, prisoners and prisons, and courts of inquiry, boards of investigation, examining boards, with clerks and witnesses' fees, and traveling expenses and costs; stationery and recording; expenses of purchasing paymasters' offices of the various cities, including clerks, furniture, fuel, stationery, and incidental expenses; newspapers and advertising; foreign postage; telegraphing, foreign and domestic; telephones; copying; care of library, including purchase of books, prints, manuscripts, and periodicals; ferriage, tolls, and express fees; costs of suits; commissions, warrants, diplomas, and discharges; relief of vessels in distress; canal tolls and pilotage; recovery</p>			

*Estimates of appropriations required for the service of the fiscal year, etc.—Continued.*

Detailed objects of expenditure, and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Total amount to be appropriated under each head of appropriation	Amount appropriated for the current fiscal year ending June 30, 1890.
<b>PAY, MISCELLANEOUS—continued.</b>			
of valuables from shipwrecks; quarantine expenses; reports, professional investigation, cost of special instruction at home or abroad in maintenance of students and attachés, and information from abroad and the collection and classification thereof, and other necessary incidental expenses (Appropriated March 2, 1889) .....		\$240, 000	\$225, 000
<b>CONTINGENT, NAVY.</b>			
For all emergencies and extraordinary expenses arising at home or abroad, but impossible to be anticipated or classified, exclusive of personal services in the Navy Department or any of its subordinate bureaus or offices at Washington, D. C. (March 2, 1889) .....		7, 000	7, 000
<b>PRINTING AND BINDING.</b>			
Printing and binding for the Navy Department, including \$28, 000 for the Hydrographic Office, to be executed under the direction of the Public Printer. (March 2, 1889) .....		90, 000	60, 000

*Estimate of the amount required to pay the officers of the United States Navy on the active list for the fiscal year ending June 30, 1891.*

Grade.	Total number.	Sea duty.			Other duty.			Waiting orders.		
		No.	Pay per annum.	Total.	No.	Pay per annum.	Total.	No.	Pay per annum.	Total.
Admiral.....	1				1	\$12,000	\$12,000			
Rear-admirals.....	6	3	\$6,000	\$18,000	2	5,000	10,000	1	\$4,000	\$4,000
Commodore, Chief of Bureau.....	1				1	5,000	5,000			
Commodore.....	9	1	5,000	5,000	6	4,000	24,000	2	3,000	6,000
Captains, Chief of Bureaus.....	3				3	5,000	15,000			
Captains.....	42	14	4,500	63,000	18	3,500	63,000	10	2,800	28,000
Commanders.....	85	26	3,500	91,000	36	3,000	108,000	23	2,300	52,900
Lieutenant-commanders:										
After four years from date of commission.....	66	30	3,000	90,000	28	2,600	72,800	8	2,200	17,600
First four years from date of commission.....	8	5	2,800	14,000	3	2,400	7,200			
Lieutenants:										
After five years from date of commission.....	223	107	2,600	278,200	91	2,200	200,200	25	1,800	45,000
First five years from date of commission.....	27	17	2,400	40,800	8	2,000	16,000	2	1,600	3,200
Junior grade after five years from date of commission.....	44	25	2,000	50,000	15	1,700	25,500	4	1,400	5,600
Junior grade first five years from date of commission.....	32	16	1,800	28,800	14	1,500	21,000	2	1,200	2,400
Ensigns, after five years from date of commission.....	183	121	1,400	169,400	47	1,200	56,400	15	1,000	15,000
Naval cadets, undergraduates.....	72	72	950	68,400						
Medical directors:										
Chief of Bureau.....	1				1	5,000	5,000			
After twenty years from date of commission as surgeon.....	14				10	4,400	44,000	4	3,000	12,000
Medical inspectors:										
Fleet surgeon.....	3	3	4,400	13,200						
After twenty years from date of commission as surgeon.....	12				10	4,000	40,000	2	3,000	6,000
Surgeons:										
After twenty years from date of commission as surgeon.....	1	1	4,200	4,200						
Fourth five years from date of commission as surgeon.....	0	4	3,700	14,800	4	3,600	14,400	1	2,800	2,800
Third five years from date of commission as surgeon.....	11	7	3,200	22,400	2	3,200	6,400	2	2,600	5,200
Second five years from date of commission as surgeon.....	10	7	2,900	20,300	7	2,800	19,600	2	2,400	4,800
First five years from date of commission as surgeon.....	13	6	2,800	16,800	6	2,400	14,400	1	2,000	2,000
Passed assistant surgeons, after five years from date of appointment.....	85	35	2,200	77,000	15	2,000	30,000	5	1,700	8,500
Assistant surgeons:										
After five years.....										
First five years.....	9	6	1,900	11,400	3	1,000	4,800			
Not in line of promotion.....	14	13	1,700	22,100	1	1,400	1,400			
Pay directors:										
Chief of Bureau.....	2	1	2,100	2,100	1	2,100	2,100			
After twenty years from date of commission as paymaster.....	1									
Pay inspectors:										
Fleet paymasters.....	4	4	4,400	17,600						
After twenty years from date of commission as paymaster.....	9				6	4,000	24,000	3	3,000	9,000

<b>Paymasters:</b>	15	6	4,200	25,200	8	4,000	32,000	1	3,000	3,000
After only years from date of commission as paymaster.....	5	4	3,700	14,800					2,800	2,800
Fourth five years from date of commission as paymaster.....	15	6	3,500	21,000	8	3,200	25,000	1	2,600	2,600
Third five years from date of commission as paymaster.....	5	2	3,200	6,400	3	2,800	8,400			
Second five years from date of commission as paymaster.....	1	1	2,800	2,800						
First five years from date of commission as paymaster.....										
<b>Passed assistant paymasters:</b>	20	11	2,200	24,200	8	2,000	16,000	1	1,700	1,700
After five years from date of commission.....	5							2	1,500	3,000
First five years from date of commission.....	12	9	1,900	17,100	3	1,600	4,800			
Assistant paymasters after five years from date of commission.....										
<b>Chief engineers:</b>	1									
Chief of Bureau.....	1	4	4,400	17,600	1	5,000	5,000			
Fleet engineers.....	27	4	4,400	17,600	10	4,000	76,000	4	3,000	
After twenty years from date of commission.....	10	4	3,700	14,800	6	3,000	21,000			12,000
Fourth five years from date of commission.....	10	4	3,500	14,000						
Third five years from date of commission.....	18	10	3,200	32,000	7	2,800	19,600	1	2,400	2,400
Second five years from date of commission.....	6	2	2,800	5,600	2	2,400	4,800	2	2,000	4,000
First five years from date of commission.....										
<b>Passed assistant engineers:</b>	35	15	2,700	40,500	18	2,350	42,300	2	1,850	3,000
Fourth five years from date of commission.....	19	9	2,450	22,050	8	2,250	18,000	2	1,900	3,800
Third five years from date of commission.....	17	10	2,200	22,000	7	2,000	14,000			
Second five years from date of commission.....	1	1	1,800	1,800						
First five years from date of commission.....	67	28	1,900	53,200	33	1,600	52,800	6	1,200	7,200
Assistant engineers, after five years from date of commission.....										
<b>Chaplains:</b>	21	7	2,800	19,600	6	2,300	13,800	8	1,800	15,200
After five years from date of commission.....	3	2	2,500	5,000				1	1,600	1,600
First five years from date of commission.....										
<b>Professors of mathematics:</b>	7									
After fifteen years from date of commission.....	3									
Third five years from date of commission.....	1									
Chief constructor, Chief of Bureau.....	6									
<b>Naval constructors:</b>	5									
Fourth five years from date of commission.....	11									
First five years from date of commission.....										
Assistant naval constructors, after eight years from date of commission.....										
<b>Civil engineers:</b>	4									
After fifteen years from date of commission.....	3									
Third five years from date of commission.....	35	16	1,800	28,800	15	1,600	24,000	4	1,200	4,800
Second five years from date of commission.....	36	14	1,800	25,200	17	1,600	27,200	5	1,200	6,000
Gunners, after twelve years from date of appointment.....	50	19	1,800	34,200	26	1,600	41,600	5	1,200	6,000
Carpenters, after twelve years from date of appointment.....	28	17	1,800	30,600	9	1,600	14,400	2	1,200	2,400
Salinakers, after twelve years from date of appointment.....	30	15	900	18,500	14	700	9,800	1	500	500
Mates.....										
<b>Total</b>	1,518	743		1,650,450	608		1,484,000	167		330,000

Total pay for 1,518 officers on the active list

**\$3,460,250**

**Pay for 270 naval cadets under instruction at Naval Academy, at \$500 per annum.**

135,000

**Aggregate.**

3,601,250



*Estimate of the amount required to pay retired officers of the United States Navy for the fiscal year ending June 30, 1891.*

Grade.	No.	Pay per annum.	Amount.	Grade.	No.	Pay per annum.	Amount.
Vice-Admiral.....	1	\$9,000	\$9,000	Paymasters.....	2	\$2,400	\$4,800
Rear-admirals.....	1	6,000	6,000	Do.....	1	1,400	1,400
Rear-admirals.....	40	4,500	180,000	Passed assistant paymasters	1	1,650	1,650
Commodores.....	10	3,750	37,500	Do.....	1	1,500	1,500
Captains.....	4	3,375	13,500	Do.....	1	1,425	1,425
Do.....	2	2,625	5,250	Assistant paymaster.....	1	1,425	1,425
Do.....	2	2,250	4,500	Chief engineers.....	1	3,750	3,750
Do.....	1	900	900	Do.....	10	3,300	33,000
Commanders.....	5	2,625	13,125	Do.....	3	2,625	7,875
Do.....	4	1,750	7,000	Do.....	1	2,400	2,400
Lieutenant-commanders.....	15	2,250	33,750	Passed assistant engineers.....	2	2,025	4,050
Do.....	1	1,950	1,950	Do.....	17	1,650	28,050
Do.....	1	1,500	1,500	Do.....	1	1,837	1,837
Do.....	1	1,350	1,350	Do.....	1	1,500	1,500
Do.....	3	1,100	3,300	Do.....	3	1,275	3,825
Do.....	1	700	700	Do.....	2	1,100	2,200
Lieutenants.....	17	1,950	33,150	Do.....	1	850	850
Do.....	3	1,800	5,400	Do.....	1	400	400
Do.....	2	1,200	2,400	Assistant engineers.....	15	1,425	21,375
Do.....	3	900	2,700	Do.....	6	1,275	7,650
Lieutenants (junior grade).....	8	1,500	12,000	Do.....	1	950	950
Do.....	5	1,350	6,750	Do.....	2	850	1,700
Do.....	3	900	2,700	Do.....	1	600	600
Ensigns.....	8	900	7,200	Do.....	1	500	500
Do.....	2	600	1,200	Chaplains.....	5	2,100	10,500
Do.....	1	500	500	Professors of mathematics.....	4	2,625	10,500
Do.....	1	300	300	Naval constructors.....	1	3,750	3,750
Medical directors.....	2	3,750	7,500	Do.....	1	3,375	3,375
Do.....	19	3,300	62,700	Do.....	1	1,950	1,950
Medical inspectors.....	6	3,300	19,800	Do.....	1	3,150	3,150
Surgeons.....	4	2,625	10,500	Civil engineers.....	1	3,250	3,250
Do.....	2	2,400	4,800	Do.....	1	2,625	2,625
Do.....	1	2,100	2,100	Boatswains.....	17	1,350	22,950
Passed assistant surgeons.....	5	1,650	8,250	Do.....	1	900	900
Do.....	1	1,100	1,100	Do.....	1	600	600
Assistant surgeons.....	3	1,425	4,275	Gunners.....	17	1,350	22,950
Do.....	1	1,275	1,275	Carpenters.....	6	1,350	8,100
Pay directors.....	2	3,750	7,500	Sailmakers.....	10	1,350	13,500
Do.....	6	3,300	19,800	Do.....	1	500	500
Pay inspectors.....	3	3,300	9,900	Total.....	346		801,762
Paymasters.....	1	2,775	2,775				
Do.....	1	2,550	2,550				

*Number of secretaries and clerks, and their pay, allowed to commandants of yards and stations, to paymasters of yards, to inspectors, and on receiving-ships and cruising vessels.*

Number and designation.	Where employed.	Pay.
Two secretaries, at \$2,500 each.....	To Admiral and Vice-Admiral....	\$5,000
One first clerk to commandant.....	Navy-yard, Portsmouth, N. H.....	1,500
One second clerk to commandant.....	do.....	1,200
One clerk to paymaster of yard.....	do.....	1,400
One clerk to inspection of provisions and clothing.....	do.....	1,300
One first clerk to commandant.....	Navy-yard, Boston, Mass.....	1,500
One clerk to paymaster of yard.....	do.....	1,600
One clerk to inspection of provisions and clothing.....	do.....	1,600
One clerk to paymaster of receiving-ship.....	do.....	1,600
One first clerk to commandant.....	Navy-yard, New York, N. Y.....	1,500
One second clerk to commandant.....	do.....	1,200
One clerk to paymaster of yard.....	do.....	1,600
One clerk to inspection of provisions and clothing.....	do.....	1,600
One clerk to paymaster of receiving-ship.....	do.....	1,600
One first clerk to commandant.....	Navy-yard, League Island, Pa.....	1,500
One second clerk to commandant.....	do.....	1,200
One clerk to paymaster of yard.....	do.....	1,600
One clerk to inspection of provisions and clothing.....	do.....	1,600
One clerk to paymaster of receiving-ship.....	do.....	1,600
One first clerk to commandant.....	Navy-yard, Norfolk, Va.....	1,500
One second clerk to commandant.....	do.....	1,200
One clerk to paymaster of yard.....	do.....	1,400
One clerk to inspection of provisions and clothing.....	do.....	1,300

*Number of secretaries and clerks, and their pay, etc.—Continued.*

Number and designation.	Where employed.	Pay.
One clerk to paymaster of receiving-ship .....	Navy-yard, Norfolk, Va .....	\$1,300
One clerk to paymaster of vessels on James River .....	do .....	1,000
One first clerk to commandant .....	Navy-yard, Washington, D. C .....	1,500
Two second clerks to commandant, at \$1,200 each .....	do .....	2,400
One clerk to paymaster of yard .....	do .....	1,600
One clerk to inspection of provisions and clothing .....	do .....	1,600
One clerk to paymaster of receiving-ship .....	do .....	1,300
One second clerk to commandant .....	Navy-yard, Pensacola, Fla .....	1,200
One clerk to paymaster of yard .....	do .....	1,400
One first clerk to commandant .....	Navy-yard, Mare Island, Cal .....	1,800
One second clerk to commandant .....	do .....	1,200
One clerk to paymaster of yard .....	do .....	1,800
One clerk to inspection of provisions and clothing .....	do .....	1,300
One clerk to paymaster of receiving-ship .....	do .....	1,800
One clerk to commandant .....	Naval Station, New London, Conn .....	1,500
One clerk to paymaster of station .....	do .....	1,300
One clerk to commandant .....	Training Station, Newport, R. I .....	1,500
One clerk to paymaster of receiving-ship .....	do .....	1,300
One clerk to paymaster of station .....	Torpedo Station, Newport, R. I .....	1,300
One clerk to superintendent .....	War College, Newport, R. I .....	1,500
One clerk to commandant .....	Naval station, Key West, Fla .....	1,500
One clerk to paymaster of station .....	do .....	1,300
One first clerk to commandant .....	Naval Academy, Annapolis, Md .....	1,500
One clerk to cadets' store-keeper .....	do .....	1,300
One clerk to general store-keeper .....	do .....	1,300
One clerk to commissary .....	do .....	1,300
One clerk to paymaster of Academy .....	do .....	1,300
One clerk to paymaster of ships .....	do .....	1,300
One clerk to commanding officer .....	Naval Asylum, Philadelphia, Pa .....	1,500
One clerk to paymaster .....	do .....	1,300
One clerk to general inspector pay corps .....	do .....	1,300
Ten clerks to paymasters of flag-ships, at \$1,100 each .....	do .....	11,000
Seven clerks to paymasters of second-rate ships, at \$1,100 each .....	do .....	7,700
Twenty-one clerks to paymasters of third-rate training and store ships, at \$1,000 each .....	do .....	21,000
Total .....	do .....	121,300

#### RECAPITULATION.

Total pay for 1,518 officers on the active list .....	\$3,466,250
Total pay for 270 naval cadets under instructions .....	135,000
Total pay for 346 officers on the retired list .....	801,762
Total pay for 2 secretaries and 92 clerks .....	121,300
Total .....	4,524,312

## REPORT OF THE SECRETARY OF THE NAVY.

*Schedule of bids and statement of contracts awarded and entered into to furnish stationery for the Secretary's Office and Bureaus of the Navy Department for the fiscal year ending June 30, 1890.*

	Bidder.	Class 1.	Class 2.	Class 3.	Class 4.	Class 5.	Class 6.	Class 7.	Class 8.	Class 9.
1	William H. Teepe .....			*\$682.06		\$18.55		\$228.99	\$59.44	\$203.90
2	P. P. Kellogg & Co .....	*\$939.57								
3	Wyckoff, Seamans & Benedict .....			806.41						
4	V. G. Fisher, manager .....	1,110.18								
5	E. Morrison .....				†\$127.82	12.97	†\$14.53			
6	Rowland A. Robbins .....	1,182.20	*\$1,055.11	863.76	175.88	19.90	*19.08	202.33		160.37
7	Armstrong, Craig & Co .....				(†)					
8	William Ballantyne & Son .....				*168.82			*178.41	*46.45	*126.87

	Bidder.	Class 10.	Class 11.	Class 12.	Class 13.	Class 14.	Class 15.	Date of advertisement.	Date of contract.	Amount of contract.
1	William H. Teepe .....	\$275.94				*\$51.22	*\$87.27	May 28, 1889	July 12, 1889	\$820.55
2	P. P. Kellogg & Co .....							do	July 11, 1889	939.57
3	Wyckoff, Seamans & Benedict .....							do		
4	V. G. Fischer, manager .....							do		
5	E. Morrison .....							do	July 13, 1889	12.97
6	Rowland A. Robbins .....	*149.07	\$270.58	*\$429.90	*\$90.45	58.74	91.78	do	July 5, 1889	1,743.61
7	Armstrong, Craig & Co .....							do		
8	William Ballantyne & Son .....	153.97	*200.31					do	July 3, 1889	720.86
	Total .....									4,237.56

\*Awarded the contract.

†Altered schedule.

‡Informal, and thrown out.

*Schedule of bids and statement of contracts awarded and entered into to wash towels and furnish ice for the Navy Department during the fiscal year ending June 30, 1890.*

## TOWELS.

No.	Bidders.	Date of advertisement.	Amount of bid.	Date of contract.
			<i>Per hundred.</i>	
1	Mrs. Charlotte Smith .....	May 28, 1889	\$1.50	
2	Catharine C. Lee .....	do	2.00	
3	Olivia West .....	do	.48	
4	Lucinda Smith .....	do	.98	
5	M. A. Weaver .....	do	*.44	July 5, 1889
6	Mary E. Thomas .....	do	.67	
7	Lucy Cook .....	do	1.50	

## ICE.

1	Independent Ice Company, J. K. Yerkes, superintendent.	May 17, 1889	*36½ cents per 100 pounds.	June 26, 1889
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\*Awarded.

[A \* marks each successful bid.]

The Columbian Iron Works and Dry-Dock Company, Baltimore, Md., for the construction of such boat, complete, according to bidders' plans and specifications .....	\$150, 000
Same company, for the construction of said boat, complete, according to other and different plans and specifications of the bidders.....	115, 000
Same company, for the construction of said boat, complete, according to a third and different set of plans and specifications of the bidders .....	100, 000
George C. Baker, Des Moines, Iowa, for the construction of such boat, complete, according to bidder's plans and specifications .....	75, 000

<b>Class 1. Plate-planing machine:</b>	
Niles Tool Works.....	\$7,397.00
*Bement, Miles & Co.....	5,300.00
S. C. Forsaith Machine Company { A.....	7,196.00
{ B.....	6,500.00
<b>Class 2. Plate-planing machine:</b>	
Niles Tool Works.....	2,274.00
Bement, Miles & Co.....	3,300.00
S. C. Forsaith Machine Company.....	2,817.00
<b>Class 3. Planing machine:</b>	
*Detrick & Harvey.....	3,520.00
S. C. Forsaith Machine Company.....	3,961.50
<b>Class 4. Punching and shearing machine:</b>	
Niles Tool Works.....	4,550.00
Bement, Miles & Co.....	7,450.00
S. C. Forsaith Machine Company.....	5,365.00
Dunham, Carrigan & Hayden Company.....	4,190.00
<b>Class 5. Punching and shearing machine:</b>	
*Niles Tool Works.....	3,287.00
Bement, Miles & Co.....	4,170.00
S. C. Forsaith Machine Company.....	2,995.00
Dunham, Carrigan & Hayden Company.....	3,480.00
<b>Class 6. Punching and shearing machine:</b>	
Niles Tool Works.....	2,296.00
Bement, Miles & Co.....	3,800.00
S. C. Forsaith Machine Company.....	2,125.00
Dunham, Carrigan & Hayden Company.....	2,760.00
<b>Class 7. Punching machine:</b>	
Niles Tool Works.....	2,047.00
Bement, Miles & Co.....	2,425.00
S. C. Forsaith Machine Company.....	1,899.00
Dunham, Carrigan & Hayden Company.....	1,675.00
<b>Classes 8 and 9. Punching machines:</b>	
Niles Tool Works.....	2,758.00
Bement, Miles & Co.....	3,200.00

## Classes 8 and 9. Punching machines—Continued.

S. C. Forsaith Machine Company .....	\$2,396.00
Dunham, Carrigan & Hayden Company .....	2,100.00
Class 10. Punching machine:	
Niles Tool Works .....	1,128.00
*Bement, Miles & Co .....	950.00
S. C. Forsaith Machine Company .....	941.00
Dunham, Carrigan & Hayden Company .....	760.00
Class 11. Beam-bending and horizontal punching machine:	
Niles Tool Works .....	2,566.00
Bement, Miles & Co .....	3,650.00
S. C. Forsaith Machine Company .....	3,195.00
Class 12. Horizontal punch:	
Niles Tool Works .....	1,836.00
Bement, Miles & Co .....	2,975.00
S. C. Forsaith Machine Company .....	2,765.00
Class 13. Double angle-bar shearing machine:	
Niles Tool Works .....	2,447.00
Bement, Miles & Co .....	2,700.00
S. C. Forsaith Machine Company .....	3,439.00
Class 14. Beam and angle setting and bending machine:	
Niles Tool Works .....	3,576.00
Bement, Miles & Co .....	4,000.00
S. C. Forsaith Machine Company .....	3,453.84
Class 15. Angle-bar or beam-straightening machine:	
*Niles Tool Works .....	625.00
S. C. Forsaith Machine Company .....	627.00
Class 16. Set of bending rolls:	
*Niles Tool Works .....	40,297.00
S. C. Forsaith Machine Company .....	24,838.00
Class 17. Set of bending rolls:	
Niles Tool Works { A .....	4,191.00
B .....	5,549.00
Joseph J. White .....	5,100.00
*Bement, Miles & Co .....	5,050.00
S. C. Forsaith Machine Company .....	5,786.00
Class 18. Set of bending rolls:	
Niles Tool Works .....	1,284.00
C. Rittenhouse & Sons { A .....	1,378.20
B .....	1,091.96
Joseph J. White .....	1,854.00
Bement, Miles & Co .....	1,100.00
S. C. Forsaith Machine Company .....	1,856.00
Class 19. Plate-straightening machine:	
Niles Tool Works .....	3,792.00
*Bement, Miles & Co .....	3,200.00
S. C. Forsaith Machine Company .....	3,398.00
Class 20. Hydraulic accumulator:	
Niles Tool Works .....	2,935.00
*Builders' Iron Foundry .....	2,700.00
Joseph J. White .....	3,350.00
S. C. Forsaith Machine Company { A .....	2,777.00
B .....	2,345.00
Class 21. Duplex pressure-pump:	
Niles Tool Works .....	1,065.00
A. L. Fish .....	795.00
Joseph J. White .....	3,000.00
S. C. Forsaith Machine Company .....	887.50
*H. P. Gregory & Co .....	1,275.00
William C. Codd .....	890.00
R. A. Robbins .....	1,197.00
Class 22. Portable hydraulic riveting-machine:	
Niles Tool Works .....	2,725.00
Joseph J. White .....	1,600.00
S. C. Forsaith Machine Company { A .....	2,660.00
B .....	2,224.00
Class 23. Portable hydraulic riveting-machine:	
Niles Tool Works .....	2,294.00
Joseph J. White .....	1,400.00
S. C. Forsaith Machine Company { A .....	2,314.00
B .....	1,975.00

<b>Classes 24 and 25. Portable hydraulic riveting-machines:</b>	
Niles Tool Works .....	\$4,062.00
Joseph J. White .....	2,450.00
S. C. Forsaith Machine Company { A .....	4,382.00
B .....	3,562.00
<b>Class 26. Vertical drilling machine:</b>	
Niles Tool Works .....	925.00
Joseph J. White .....	1,042.00
*Bement, Miles & Co. ....	820.00
S. C. Forsaith Machine Company .....	891.00
<b>Classes 27 and 28. Suspended drilling machines:</b>	
Niles Tool Works .....	2,398.00
*Joseph J. White .....	875.00
Bement, Miles & Co. ....	1,600.00
S. C. Forsaith Machine Company .....	1,820.00
Universal Radial Drill Company .....	820.00
<b>Class 29. Portable drilling machine:</b>	
*S. C. Forsaith Machine Company .....	346.00
R. A. Robbins .....	373.00
<b>Classes 30 and 31. Suspended countersinking machines:</b>	
Niles Tool Works .....	2,300.00
Bement, Miles & Co. ....	760.00
S. C. Forsaith Machine Company .....	934.00
*Universal Radial Drill Company .....	680.00
<b>Class 32. Countersinking machine:</b>	
*Bement, Miles & Co. ....	700.00
S. C. Forsaith Machine Company .....	787.00
Universal Radial Drill Company .....	1,215.00
<b>Class 33. Milling machine:</b>	
S. C. Forsaith Machine Company .....	1,084.00
Brown & Sharpe Manufacturing Company .....	1,165.00
R. A. Robbins .....	1,397.00
<b>Class 34. Portable crane</b>	
Niles Tool Works .....	2,895.00
S. C. Forsaith Machine Company .....	1,892.50
*James W. Soper .....	1,700.00
<b>Class 35. Cold-sawing machine:</b>	
*S. C. Forsaith Machine Company { A .....	1,892.00
B .....	2,859.00
<b>Class 36. Grinding machine:</b>	
S. C. Forsaith Machine Company .....	534.40
James W. Soper .....	630.00
R. A. Robbins .....	747.00
<b>Class 37. Emery wheel tool grinder:</b>	
*S. C. Forsaith Machine Company .....	259.00
James W. Soper .....	277.00
R. A. Robbins .....	324.00
<b>Class 38. Sturtevant blower:</b>	
George Place .....	1,465.00
*S. C. Forsaith Machine Company .....	1,275.00
H. P. Gregory and Company .....	1,585.00
B. F. Sturtevant .....	1,250.00
R. A. Robbins .....	1,473.00
<b>Class 39. Foundry rattler:</b>	
S. C. Forsaith Machine Company .....	273.00
Brown & Sharpe Manufacturing Company .....	260.00
*James W. Soper .....	270.00
R. A. Robbins .....	323.00
<b>Class 40. Portable rivet forges:</b>	
*S. C. Forsaith Machine Company .....	272.04
Dunham, Carrigan & Hayden Company { A .....	348.00
B .....	468.00
W. C. Codd .....	386.00
Albert Gallatin .....	384.00
<b>Class 41. Ratchet drills:</b>	
S. C. Forsaith Machine Company .....	370.00
Dunham, Carrigan and Hayden Company .....	240.00
William C. Codd .....	247.00
Albert Gallatin .....	197.50
*James W. Soper .....	185.00
R. A. Robbins .....	345.00

<b>Class 42. Ratchet drills:</b>	
S. C. Forsaith Machine Company.....	\$205.00
Dunham, Carrigan and Hayden Company .....	150.00
W. C. Codd.....	148.50
Albert Gallatin.....	123.75
*James W. Soper.....	110.00
R. A. Robbins.....	274.25
<b>Class 43. Ratchet drills:</b>	
S. C. Forsaith Machine Company.....	235.00
Dunham, Carrigan and Hayden Company.....	250.00
W. C. Codd.....	154.75
Albert Gallatin.....	131.25
*James W. Soper.....	125.00
R. A. Robbins.....	310.00
<b>Class 44. Pulley blocks:</b>	
S. C. Forsaith Machine Company.....	245.00
Dunham, Carrigan and Hayden Company.....	278.25
W. C. Codd.....	251.30
*Albert Gallatin.....	192.50
James W. Soper.....	196.00
R. A. Robbins.....	273.00
<b>Class 45. Pulley blocks:</b>	
S. C. Forsaith Machine Company.....	165.00
Dunham, Carrigan and Hayden Company.....	175.00
W. C. Codd.....	174.00
*Albert Gallatin.....	119.00
James W. Soper.....	120.00
R. A. Robbins.....	194.00
<b>Class 46. Pulley blocks:</b>	
S. C. Forsaith Machine Company.....	220.50
Dunham, Carrigan and Hayden Company.....	220.50
W. C. Codd.....	210.00
*Albert Gallatin.....	143.50
James W. Soper.....	147.00
R. A. Robbins.....	327.60
<b>Class 47. Measuring tools:</b>	
George Place.....	435.00
S. C. Forsaith Machine Company.....	442.50
Brown and Sharpe Manufacturing Company .....	515.25
Dunham, Carrigan and Hayden Company.....	431.85
*Albert Gallatin.....	414.50
James W. Soper.....	423.00
R. A. Robbins.....	447.70
<b>Class 48. Corliss engine</b>	
*George Place.....	16,900.00
Union Iron Works.....	20,500.00
Vulcan Iron Works.....	34,793.00
<b>Class 49. Shafting:</b>	
C. Rittenhouse & Sons.....	696.00
George Place.....	379.52
*S. C. Forsaith Machine Company.....	227.60
Union Iron Works.....	688.00
Vulcan Iron Works.....	1,008.00
W. C. Codd.....	469.57
R. A. Robbins.....	309.60

*Machinery for the United States armored cruiser Maine.*

\*N. F. Palmer, jr., & Co., New York, N. Y. (machinery to be constructed according to Department's plans and specifications)..... \$735,000.00

*Schedule of proposals for materials required for use in the construction of the United States monitor Terror, at the Navy-Yard, Brooklyn, N. Y.*

<b>Class 5. White oak:</b>	
J. W. Duryee.....	\$1,303.75
J. Cregan.....	1,617.50
L. H. Ross.....	1,522.50

<b>Class 7. Yellow-pine logs:</b>	
*J. W. Duryee.....	\$13,038.88
J. Cregan.....	14,758.01
L. H. Ross.....	13,928.88
<b>Class 13. White-pine plank boards:</b>	
J. W. Duryee.....	5,903.75
*Watson & Pittinger.....	4,773.60
J. Cregan.....	5,943.00
L. H. Ross.....	6,086.25
<b>Class 15. White ash:</b>	
J. W. Duryee.....	1,284.60
J. Cregan.....	1,346.00
*L. H. Ross.....	1,235.00
<b>Class 16. White-ash oars:</b>	
*J. W. Soper.....	95.16
E. J. Griffith & Co.....	99.05
R. A. Robbins.....	97.55
J. W. Duryee.....	158.70
A. Flagler.....	99.05
J. Cregan.....	125.75
<b>Class 18. Black walnut, mahogany, maple, cherry, etc.:</b>	
J. W. Duryee.....	1,796.50
*Watson & Pittinger.....	1,525.00
J. Cregan.....	1,773.50
J. J. Donovan.....	1,732.00
L. H. Ross.....	1,715.00
<b>Class 22. Cypress cedar:</b>	
*C. F. Hodsdon.....	588.70
J. W. Duryee.....	599.00
<b>Class 24. White-oak staves and headings:</b>	
*R. A. Robbins.....	109.25
J. W. Duryee.....	111.25
J. Cregan.....	148.00
<b>Class 26. Furniture:</b>	
*Wechsler & Abraham.....	123.93
R. A. Robbins.....	128.60
J. Cregan.....	155.00
J. J. Donovan.....	159.00
<b>Class 32. Wrought-iron:</b>	
*R. A. Robbins.....	1,376.07
C. H. Tucker, jr.....	1,470.02
T. N. Motley.....	1,474.12
A. R. Whitney.....	1,425.35
<b>Class 35. Steel:</b>	
*R. A. Robbins.....	20.00
C. H. Tucker, jr.....	29.97
T. N. Motley.....	31.95
<b>Class 37. Bolts and nuts:</b>	
R. A. Robbins.....	571.00
C. H. Tucker, jr.....	738.74
*Donegan & Swift.....	537.25
J. J. Donovan.....	762.13
<b>Class 39. Iron cut nails:</b>	
R. A. Robbins.....	166.10
C. H. Tucker, jr.....	166.71
*F. T. Witte Hardware Company.....	148.38
A. Flagler.....	171.71
T. N. Motley.....	148.76
<b>Class 43. Zinc:</b>	
E. J. Griffith & Co.....	85.00
R. A. Robbins.....	57.00
C. H. Tucker, jr.....	61.00
Donegan & Swift.....	59.00
*T. N. Motley.....	52.00
<b>Class 44. Tin:</b>	
E. J. Griffith & Co.....	780.00
R. A. Robbins.....	711.90
C. H. Tucker, jr.....	699.00
Donegan & Swift.....	705.00
A. Flagler.....	840.00
*T. N. Motley.....	696.00



<b>Class 48. Locks, hinges, bolts, of brass and iron:</b>	
E. J. Griffith & Co.....	\$344. 20
R. A. Robbins.....	346. 29
C. H. Tucker, jr.....	319. 03
F. T. Witte Hardware Company.....	357. 00
*A. Flagler.....	311. 19
<b>Class 49. Screws of brass and iron:</b>	
J. W. Soper.....	491. 12
E. J. Griffith & Co.....	454. 57
R. A. Robbins.....	480. 16
C. H. Tucker, jr.....	438. 79
F. T. Witte Hardware Company.....	459. 76
A. Flagler.....	446. 59
*T. N. Motley.....	428. 25
<b>Class 54. Hardware:</b>	
E. J. Griffith & Co.....	4, 360. 95
R. A. Robbins.....	4, 215. 94
C. H. Tucker, jr.....	3, 825. 78
F. T. Witte Hardware Company.....	3, 956. 66
Donegan & Swift.....	4, 810. 72
A. Flagler.....	4, 124. 32
*T. N. Motley.....	3, 260. 53
J. J. Donovan.....	4, 434. 69
<b>Class 56. White lead:</b>	
E. J. Griffith & Co.....	448. 50
Pleasants & Woodworth.....	458. 85
R. A. Robbins.....	462. 30
*C. H. Tucker, jr.....	431. 25
A. Flagler.....	445. 05
T. N. Motley.....	469. 20
J. J. Donovan.....	469. 20
<b>Class 57. Zinc paints:</b>	
Pleasants & Woodworth.....	297. 15
R. A. Robbins.....	241. 50
C. H. Tucker, jr.....	224. 00
A. Flagler.....	227. 50
*T. N. Motley.....	189. 00
J. J. Donovan.....	224. 50
<b>Class 58. Colored paints, driers:</b>	
E. J. Griffith & Co.....	969. 40
Pleasants & Woodworth.....	848. 78
D. J. Isaacs.....	846. 40
R. A. Robbins.....	936. 39
C. H. Tucker, jr.....	868. 35
A. Flagler.....	844. 05
*T. N. Motley.....	756. 75
J. J. Donovan.....	925. 85
<b>Class 59. Linseed oil:</b>	
*E. J. Griffith & Co.....	369. 60
Pleasants & Woodworth.....	385. 34
R. A. Robbins.....	409. 20
C. H. Tucker, jr.....	396. 00
A. Flagler.....	429. 00
T. N. Motley.....	382. 80
J. J. Donovan.....	396. 00
<b>Class 60. Varnish, spirits of turpentine:</b>	
Pleasants & Woodworth.....	306. 00
D. J. Isaacs.....	306. 20
R. A. Robbins.....	301. 35
*C. H. Tucker, jr.....	295. 75
A. Flagler.....	342. 60
J. J. Donovan.....	316. 50
<b>Class 61. Alcohol:</b>	
*Pleasants & Woodworth.....	99. 00
R. A. Robbins.....	135. 00
T. N. Motley.....	110. 25
J. J. Donovan.....	121. 50
<b>Class 65. Fish oil:</b>	
Pleasants & Woodworth.....	18. 24
R. A. Robbins.....	16. 96

## Class 65. Fish oil—Continued.

*T. N. Motley.....	\$12.80
J. J. Donovan .....	19.20

## Class 68. Glass:

Pleasants & Woodworth.....	17.50
R. A. Robbins .....	17.00
*A. Flagler .....	14.50
J. Cregan .....	27.90
J. J. Donovan .....	19.00

## Class 69. Brushes:

E. J. Griffith & Co.....	139.00
Pleasants & Woodworth .....	173.10
*R. A. Robbins .....	93.41
C. H. Tucker, jr .....	163.85
A. Flagler .....	167.90
J. J. Donovan .....	152.00

## Class 70. Dry goods for upholstering:

Wechsler & Abraham .....	343.11
*R. A. Robbins .....	199.96
J. J. Donovan .....	343.12

## Class 73. Ship chandlery:

*Pleasants & Woodworth .....	35.80
R. A. Robbins .....	38.80
J. J. Donovan .....	125.50

## Class 75. Rosin, pitch, crude turpentine:

E. J. Griffith & Co.....	76.50
*Pleasants & Woodworth .....	28.73
R. A. Robbins .....	28.90
J. J. Donovan .....	85.00

## Class 78. Leather:

*R. A. Robbins .....	71.20
T. N. Motley.....	160.00
J. J. Donovan .....	96.00

## Class A. Steel plates:

Temple & Lockwood.....	5,430.33
A. R. Whitney .....	4,384.28
*Linden Steel Company .....	4,001.31

## Class B. Bulb T-bars, steel:

A. R. Whitney .....	926.30
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## Class C. Steel angle-bars:

Temple & Lockwood.....	1,165.00
A. R. Whitney .....	992.84

## Class D. Steel rivets:

Temple & Lockwood.....	607.50
R. A. Robbins .....	729.00
*C. H. Tucker, jr .....	627.73
J. J. Donovan .....	641.25

## Class E. Steel plates:

Temple & Lockwood.....	9,247.59
A. R. Whitney .....	7,466.21
*Linden Steel Company.....	6,814.01

## Class F. Bulb T-bars:

Temple & Lockwood.....	299.70
A. R. Whitney .....	231.75

## Class G. Steel T-bars:

A. R. Whitney .....	10.97
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## Class H. Steel angle-bars:

Temple & Lockwood.....	2,070.36
A. R. Whitney .....	1,764.41

## Class I. Steel rivets:

Temple & Lockwood.....	501.57
R. A. Robbins.....	601.88
*C. H. Tucker, jr.....	518.25
J. J. Donovan .....	529.44

## Class K. Steel plates:

Temple & Lockwood.....	324.04
A. R. Whitney .....	261.62
*Linden Steel Company.....	238.77

## Class L. Steel T-bars:

Temple & Lockwood.....	47.56
A. R. Whitney .....	37.62

Class M. Steel angle-bars:	
Temple & Lockwood .....	\$38.88
A. R. Whitney .....	33.13
Class N. Iron castings:	
Robert Wetherill & Co. ....	1,170.00
Class O. Steel castings:	
*Standard Steel Casting Company .....	8,826.00
Class P. Composition castings:	
*C. H. Tucker, jr .....	2,627.84

*Schedule of proposals for materials required for use in the construction of the United States Monitor Monadnock, at the Navy-Yard, Mare Island, Cal.*

Class 5. White oak:	
*A. Powell .....	\$2,720.62
A. S. Carman .....	3,114.50
James McCudden .....	3,348.50
Class 7. Oregon pine logs:	
A. Powell .....	15,099.99
A. S. Carman .....	15,980.74
James McCudden .....	14,490.00
*William Walker .....	11,118.51
Class 13. Redwood plank, boards:	
A. Powell .....	3,977.50
A. S. Carman .....	4,035.70
James McCudden .....	4,074.00
*William Walker .....	3,169.30
Class 15. White ash:	
A. Powell .....	2,986.50
A. S. Carman .....	3,067.50
James McCudden .....	3,065.00
*William Walker .....	2,262.00
Class 16. White-ash oars:	
A. Powell .....	169.80
*A. Crawford .....	110.74
Albert Flagler .....	138.75
James W. Soper .....	127.29
A. S. Carman .....	179.80
James McCudden .....	180.20
Class 18. Black walnut, mahogany, maple, cherry, etc.:	
A. Powell .....	3,037.00
A. S. Carman .....	3,176.00
James McCudden .....	3,206.00
*William Walker .....	2,713.20
Class 22. Cypress, cedar:	
A. Powell .....	1,600.00
A. S. Carman .....	1,700.00
James McCudden .....	1,750.00
*William Walker .....	1,000.00
Class 24. White-oak staves and headings:	
A. Powell .....	213.75
A. S. Carman .....	237.50
James McCudden .....	230.00
*William Walker .....	194.75
Class 26. Furniture:	
*William F. Whittier .....	162.00
Rowland A. Robbins .....	163.35
Class 32. Wrought-iron, round and square:	
*George W. Gibbs & Co. ....	1,302.86
Dunham, Carrigan & Hayden Company .....	1,894.60
Class 35. Steel:	
J. H. Walker .....	40.00
W. R. S. Foye .....	16.22
*George W. Gibbs & Company .....	14.52
Class 37. Bolts and nuts:	
J. H. Walker .....	906.99
W. R. S. Foye .....	1,053.50

## Class 37. Bolts and nuts—Continued.

Dunham, Carrigan & Hayden Company.....	\$2, 153. 40
*Rowland A. Robbins.....	867. 50

## Class 39. Iron cut nails:

J. H. Walker.....	251. 48
A. Crawford.....	269. 68
W. R. S. Foye.....	252. 64
*Dunham, Carrigan & Hayden Company.....	250. 75

## Class 43. Zinc:

J. H. Walker.....	100. 00
*Austin & Phelps.....	70. 00
Dunham, Carrigan & Hayden Company.....	77. 50
Rowland A. Robbins.....	90. 00

## Class 44. Tin:

J. H. Walker.....	885. 00
Austin & Phelps.....	780. 00
*Dunham, Carrigan & Hayden Company.....	780. 00
Rowland A. Robbins.....	861. 90

## Class 48. Locks, hinges, bolts, of brass and iron:

J. H. Walker.....	481. 80
*W. R. S. Foye.....	385. 55
Albert Flagler.....	721. 40
Dunham, Carrigan & Hayden Company.....	713. 00
Rowland A. Robbins.....	455. 05

## Class 49. Screws of brass and iron:

T. N. Motley.....	599. 50
J. H. Walker.....	529. 04
Austin & Phelps.....	589. 34
W. R. S. Foye.....	487. 97
*Albert Flagler.....	468. 96
James W. Soper.....	469. 87
Dunham, Carrigan & Hayden Company.....	474. 40
Rowland A. Robbins.....	546. 70

## Class 54. Hardware:

T. N. Motley.....	6, 029. 85
J. H. Walker.....	4, 410. 85
W. R. S. Foye.....	5, 078. 12
Albert Flagler.....	4, 450. 98
*Dunham, Carrigan & Hayden Company.....	2, 670. 56
Rowland A. Robbins.....	5, 662. 65

## Class 56. White lead:

J. H. Walker.....	614. 00
Pleasants & Woodworth.....	427. 80
*William F. Whittier.....	407. 10
Dunham, Carrigan & Hayden Company.....	483. 00
Charles M. Yates.....	474. 37

## Class 57. Zinc paints:

J. H. Walker.....	297. 50
Pleasants & Woodworth.....	178. 50
*William F. Whittier.....	227. 50
Charles M. Yates.....	262. 50

## Class 58. Colored paints, driers:

J. H. Walker.....	1, 210. 54
Pleasants and Woodworth.....	830. 80
*William F. Whittier.....	861. 05
Charles M. Yates.....	903. 78

## Class 59. Linseed oil:

A. Crawford.....	475. 20
Pleasants & Woodworth.....	379. 50
*William F. Whittier.....	412. 50
Charles M. Yates.....	422. 40

## Class 60. Varnish, spirits of turpentine:

Pleasants & Woodworth.....	293. 00
William F. Whittier.....	318. 75
*Charles M. Yates.....	315. 55

## Class 61. Alcohol:

Pleasants & Woodworth.....	98. 55
*William F. Whittier.....	101. 25
Charles M. Yates.....	103. 50

Class 65. Fish oil:	
A. Crawford .....	\$16.30
Pleasants & Woodworth .....	18.24
*William F. Whittier .....	13.60
Charles M. Yates .....	14.40
Class 68. Glass:	
Pleasants & Woodworth .....	17.50
*William F. Whittier .....	12.25
Charles M. Yates .....	18.00
Class 69. Brushes:	
T. N. Motley .....	200.00
J. H. Walker .....	203.00
Pleasants & Woodworth .....	120.90
William F. Whittier .....	130.00
*Charles M. Yates .....	128.35
Class 70. Dry goods for upholstering:	
T. N. Motley .....	316.06
Rowland A. Robbins .....	306.52
Class 73. Ship chandlery:	
T. N. Motley .....	49.50
*A. Crawford .....	39.20
Pleasants & Woodworth .....	35.80
William F. Whittier .....	41.50
Rowland A. Robbins .....	49.50
Class 75. Rosin, pitch, crude turpentine:	
A. Crawford .....	68.90
Pleasants & Woodworth .....	38.73
*William F. Whittier .....	54.00
Class 78. Leather, pump, rigging, lacing:	
T. N. Motley .....	144.00
*W. R. S. Foye .....	96.00
Rowland A. Robbins .....	99.20
Class A. Steel plates—hull:	
*Park, Brother & Co. ....	4,835.89
Dunham, Carrigan & Hayden Company .....	6,001.95
Linden Steel Company, limited .....	5,887.63
Class B. Bulb T-bars, steel—hull:	
*Dunham, Carrigan & Hayden Company .....	1,258.84
Class C. Angle-bars, steel—hull:	
*Austin & Phelps .....	1,190.89
Dunham, Carrigan & Hayden Company .....	1,359.17
Class D. Rivets, steel—hull:	
J. H. Walker .....	940.25
Austin & Phelps .....	877.50
*Dunham, Carrigan & Hayden Company .....	810.00
Rowland A. Robbins .....	999.00
Class E. Steel plates—turret:	
*Park, Brother & Co. ....	8,104.17
Dunham, Carrigan & Hayden Company .....	10,058.37
Linden Steel Company, limited .....	9,866.78
Class F. Bulb T-bars—turrets:	
*Dunham, Carrigan & Hayden Company .....	349.65
Class G. T-bars, stiffeners, steel—turrets:	
*Dunham, Carrigan & Hayden Company .....	22.88
Class H. Angle-bars, steel—turrets:	
Austin & Phelps .....	1,363.99
*Dunham, Carrigan & Hayden Company .....	2,415.42
Class I. Rivets, steel—turrets:	
J. H. Walker .....	778.79
Austin & Phelps .....	724.49
*Dunham, Carrigan & Hayden Company .....	668.76
Rowland A. Robbins .....	824.80
Class K. Steel plates for military masts:	
*Park, Brother & Co. ....	288.58
Dunham, Carrigan & Hayden Company .....	358.15
Linden Steel Company, limited .....	351.33
Class L. T-bars, stiffeners, steel—military mast:	
*Austin & Phelps .....	55.50
Class M. Angle-bars, steel—military mast:	
*Austin & Phelps .....	39.74

Class N. Castings, iron—turret:	
*Robert Wetherill & Co.....	\$1,560.00
Class O. Castings, steel—turret:	
*Standard Steel Casting Company.....	11,032.50
Class P. Castings, composition—turret:	
J. H. Walker.....	3,328.64
Crown Smelting Company.....	2,452.80
*B. H. & H. Cramp.....	2,321.40

*Tabular statement of proposals received and opened April 3, 1889, for the construction of an armored coast-defense vessel, authorized by the act approved March 3, 1887.*

The William Cramp & Sons Ship and Engine Building Company, Philadelphia, Pa. (hull and machinery to be constructed according to plans and specifications provided by the Secretary of the Navy, with certain modifications thereof and changes therein, as proposed by the bidder)	\$1,614,000
N. F. Palmer, jr., & Co., New York, N. Y. (hull and machinery to be constructed according to the Department's plans and specifications).....	1,690,000
*The Union Iron Works, San Francisco, Cal. (hull and machinery to be constructed according to the Department's plans and specifications)...	1,628,950

*Machinery for the United States armored battle-ship Texas.*

I. P. Morris Company, Philadelphia, Pa. (machinery to be constructed according to Department's plans and specifications, with certain modifications thereof and changes therein, as proposed by the bidder)....	\$694,750
*The Richmond Locomotive and Machine Works, Richmond, Va. (machinery to be constructed according to Department's plans and specifications).....	634,500
N. F. Palmer, jr., & Co., New York, N. Y. (machinery to be constructed according to Department's plans and specifications).....	682,500
Southwark Foundry and Machine Company, Philadelphia, Pa. (machinery to be constructed according to the Department's plans and specifications).....	645,800
Charles Reeder & Sons, Baltimore, Md. (machinery to be constructed according to Department's plans and specifications).....	718,900

*Tabular statement of proposals received and opened August 22, 1889, for the construction of the two cruisers of about 3,000 tons each, in displacement, and of the three gun-boats or cruisers of about, but not exceeding, 2,000 tons each, in displacement, authorized by the act of September 7, 1888.*

For the construction of the two cruisers of about 3,000 tons each, in displacement, cruisers No. 7 and No. 8.

The William Cramp & Sons Ship and Engine Building Company, Philadelphia, Pa., for the construction of one of said cruisers (hull and machinery to be constructed according to Department's plans and specifications).....	\$1,225,000
Same company, for the construction of the other of said cruisers (hull and machinery to be constructed according to Department's plans and specifications).....	1,225,000

For the construction of the three cruisers of about, but not exceeding, 2,000 tons each, in displacement, cruisers No. 9, No. 10, and No. 11:

The Bath Iron Works, Bath, Me., for the construction of one of such cruisers (hull and machinery to be constructed according to Department's plans and specifications).....	780,000
The William Cramp & Sons Ship and Engine Building Company, Philadelphia, Pa., for the construction of one of such cruisers (hull and machinery to be constructed according to Department's plans and specifications).....	875,000

For the construction of the three cruisers, etc.—Continued.

Same company, for the construction of another of such cruisers (hull and machinery to be constructed according to Department's plans and specifications) .....	\$875, 000
Same company, for the construction of the other of such cruisers (hull and machinery to be constructed according to Department's plans and specifications) .....	875, 000
(No awards were made under the above-mentioned proposals.)	

*Schedule of proposals for materials required for the United States monitor Amphitrite, at the Navy-Yard, Norfolk, Va., under the Department's advertisement of August 6, 1889.*

Class 5. White oak:	
*J. Kenny .....	\$331. 25
R. A. Robbins .....	371. 75
Class 7. Yellow pine logs:	
*J. W. Gaskill & Sons .....	11, 589. 62
Class 13. White pine plank boards:	
*J. W. Gaskill & Sons .....	4, 798. 10
J. Kenny .....	4, 916. 00
R. A. Robbins .....	5, 725. 00
Class 15. White ash:	
*J. W. Gaskill & Sons .....	1, 092. 10
J. Kenny .....	1, 227. 00
R. A. Robbins .....	1, 220. 00
Class 22. Cypress cedar:	
*J. W. Gaskill & Sons .....	900. 00
Class 24. White oak staves and headings:	
*R. A. Robbins .....	106. 00
Class 32. Wrought-iron:	
T. N. Motley .....	1, 006. 60
J. R. Michael .....	7, 838. 37
R. A. Robbins .....	744. 81
*E. J. Griffith & Co. ....	543. 04
Class 35. Steel:	
T. N. Motley .....	32. 00
J. R. Michael .....	40. 00
*R. A. Robbins .....	16. 00
E. J. Griffith & Co. ....	43. 75
Class 37. Bolts and nuts:	
*T. N. Motley .....	467. 50
R. A. Robbins .....	613. 20
E. J. Griffith & Co. ....	792. 00
Class 39. Iron cut nails:	
T. N. Motley .....	181. 15
J. W. Soper .....	172. 40
*R. A. Robbins .....	154. 35
A. Flagler .....	178. 04
E. J. Griffith & Co. ....	179. 75
Class 43. Zinc:	
T. N. Motley .....	62. 00
R. A. Robbins .....	61. 25
*E. J. Griffith & Co. ....	59. 00
Class 44. Tin:	
T. N. Motley .....	696. 00
*R. A. Robbins .....	681. 90
E. J. Griffith & Co. ....	727. 50
Class 49. Screws:	
T. N. Motley .....	556. 87
J. R. Michael .....	640. 01
J. W. Soper .....	581. 32
R. A. Robbins .....	569. 49
C. H. Pleasants .....	600. 21
*A. Flagler .....	552. 80
E. J. Griffith & Co. ....	575. 93

<b>Class 54. Hardware:</b>	
*T. N. Motley.....	\$2, 102. 79
*J. W. Soper.....	1, 896. 43
R. A. Robbins.....	1, 902. 62
A. Flagler.....	1, 898. 89
E. J. Griffith & Co.....	1, 975. 89
<b>Class 58. Colored paints:</b>	
T. N. Motley.....	705. 00
R. A. Robbins.....	701. 00
C. H. Pleasants.....	713. 00
*E. J. Griffith & Co.....	637. 00
<b>Class 59. Linseed oil:</b>	
T. N. Motley.....	126. 00
R. A. Robbins.....	138. 00
C. H. Pleasants.....	132. 00
*E. J. Griffith & Co.....	119. 50
<b>Class 60. Varnish:</b>	
*T. N. Motley.....	47. 00
R. A. Robbins.....	69. 00
C. H. Pleasants.....	61. 00
E. J. Griffith & Co.....	63. 50
<b>Class 61. Alcohol:</b>	
J. R. Michael.....	79. 80
*C. H. Pleasants.....	43. 80
<b>Class 65. Fish-oil:</b>	
T. N. Motley.....	290. 50
R. A. Robbins.....	267. 30
*C. H. Pleasants.....	236. 44
E. J. Griffith & Co.....	275. 60
<b>Class 69. Brushes:</b>	
J. R. Michael.....	106. 42
*E. J. Griffith & Co.....	72. 00
<b>Class 73. Ship chandlery:</b>	
*J. W. Soper.....	56. 50
R. A. Robbins.....	57. 00
C. H. Pleasants.....	60. 19
E. J. Griffith & Co.....	58. 00

*Schedule of proposals for machines and tools required for use at the Navy-Yard, Brooklyn, New York.*

<b>Class 1. Bolt-cutter:</b>	
George Place.....	\$734. 00
*The Pratt and Whitney Company.....	660. 00
R. A. Robbins.....	674. 40
<b>Class 2. Screw-machine:</b>	
Bridgeport Machine Tool Works { A.....	1, 255. 00
B.....	1, 180. 00
*The Pratt and Whitney Company.....	1, 275. 00
R. A. Robbins.....	1, 298. 90
<b>Class 3. Screw-cutting engine lathe:</b>	
Niles Tool Works.....	405. 00
George Place.....	449. 00
<b>Class 4. Screw cutting engine lathe:</b>	
Niles Tool Works.....	376. 00
George Place.....	429. 00
*Brown and Sharpe Manufacturing Company.....	740. 00
<b>Class 5. Planer:</b>	
Niles Tool Works.....	490. 00
*The Pratt and Whitney Company.....	710. 00
R. A. Robbins.....	720. 50
<b>Class 6. Toolmaker's engine lathe:</b>	
*The Pratt and Whitney Company.....	770. 00
R. A. Robbins.....	772. 40
<b>Class 7. Shell-reamers:</b>	
Manning, Maxwell & Moore.....	627. 80
*B. C. Forsaith Machine Company.....	544. 97



Class 8. Head punches:	
Manning, Maxwell & Moore .....	\$777.00
J. W. Soper .....	578.09
*R. A. Robbins .....	365.15
S. C. Forsaith Machine Company .....	856.15
Class 9. Stock and dies:	
The Pratt and Whitney Company .....	858.50
*R. A. Robbins .....	815.00
S. C. Forsaith Machine Company .....	1,028.65
Class 10. Pipe wrenches:	
Manning, Maxwell & Moore .....	758.45
J. W. Soper .....	734.93
*R. A. Robbins .....	694.52
S. C. Forsaith Machine Company .....	845.98
Class 11. Milling cutters:	
*Brown and Sharpe Manufacturing Company .....	229.10
R. A. Robbins .....	288.49
Class 12. Ratchet-drills:	
Manning, Maxwell & Moore .....	858.80
*S. C. Forsaith Machine Company .....	846.00
Class 13. Twist-drills:	
Universal Radial Drill Company .....	1,080.00
Manning, Maxwell & Moore .....	930.00
*J. W. Soper .....	904.20
R. A. Robbins .....	950.40
S. C. Forsaith Machine Company .....	970.20
Class 14. Chain-tongs:	
*Manning, Maxwell & Moore .....	194.75
J. W. Soper .....	197.70
R. A. Robbins .....	202.00
S. C. Forsaith Machine Company .....	202.97
Class 15. Bolt-heading and rivet-making machine:	
*Niles Tool Works .....	1,340.00
George Place .....	1,399.00
Manning, Maxwell & Moore .....	1,395.00
S. C. Forsaith Machine Company .....	1,495.00
Class 16. Planing-machine:	
*J. W. Soper .....	2,040.00
Class 17. Riveting-machines:	
*Manning, Maxwell & Moore .....	450.00
J. W. Soper .....	510.00
Class 18. Steam-hammer:	
Niles Tool Works .....	1,900.00
William Sellers & Co. ....	2,319.00
*Bement, Miles & Co. ....	1,845.00
Class 19. Fittings for punches and shears:	
The Pratt and Whitney Company .....	246.46
*R. A. Robbins .....	245.82
Class 20. Fittings for punches and shears:	
Niles Tool Works .....	1,092.00
The Pratt and Whitney Company .....	546.02
*R. A. Robbins .....	544.47
Class 21. Pulley stand:	
Manning, Maxwell & Moore .....	1,042.60
*J. W. Soper .....	930.66
S. C. Forsaith Machine Company .....	1,031.17
Class 22. One "G" special grinder:	
J. W. Soper .....	981.89
*S. C. Forsaith Machine Company .....	935.65
Class 23. Twist-drill grinding-machine:	
The Pratt and Whitney Company .....	468.00
*R. A. Robbins .....	467.80
Class 24. Knife-grinding attachment:	
*J. W. Soper .....	347.41
S. C. Forsaith Machine Company .....	376.68
Class 25. Drop-lever scales:	
*Manning, Maxwell & Moore .....	388.00
R. A. Robbins .....	394.80
S. C. Forsaith Machine Company .....	475.00

Class 26. Otto gas engines :	
*J. B. Morrell & Co.....	\$1,348.00
S. C. Forsaith Machine Company.....	1,400.00
Class 27. Furnishing and placing a system of transmission of power by wire rope :	
R. A. Robbins.....	1,986.00
*N. B. Cushing.....	900.00
Class 28. Forges :	
Manning, Maxwell & Moore.....	556.00
J. W. Soper.....	550.75
R. A. Robbins.....	502.00
*S. C. Forsaith Machine Company.....	454.88
Class 29. Inspirators :	
*Manning, Maxwell & Moore.....	290.00
R. A. Robbins.....	298.40
S. C. Forsaith Machine Company.....	364.24
Class 30. Anvils :	
*Manning, Maxwell & Moore.....	384.00
R. A. Robbins.....	404.40
S. C. Forsaith Machine Company.....	432.00
Class 31. Oil cabinets, etc. :	
Manning, Maxwell & Moore.....	124.00
*J. W. Soper.....	122.09
R. A. Robbins.....	125.00
S. C. Forsaith Machine Company.....	184.45
Class 32. Magnesium covering for tops and steam-drums :	
*R. A. Robbins.....	378.00
Class 34. Hoists :	
Manning, Maxwell & Moore.....	146.40
*J. W. Soper.....	131.45
R. A. Robbins.....	203.00
S. C. Forsaith Machine Company.....	150.48
Class 35. Boring-bar :	
*Manning, Maxwell & Moore.....	366.00
R. A. Robbins.....	402.00
S. C. Forsaith Machine Company.....	415.00
Class 36. Feed pump :	
Manning, Maxwell & Moore.....	406.00
R. A. Robbins.....	444.90
*S. C. Forsaith Machine Company.....	366.17
Class 37. Miscellaneous :	
Manning, Maxwell & Moore.....	158.60
J. W. Soper.....	159.85
*R. A. Robbins.....	149.24
S. C. Forsaith Machine Company.....	178.99
Class 38. Planing-machine :	
Niles Tool Works.....	1,369.00
D. F. Walker.....	249.98
Manning, Maxwell & Moore.....	1,195.00
R. A. Robbins.....	1,148.00
*S. C. Forsaith Machine Company.....	1,120.00
Class 39. Saws :	
*Niles Tool Works.....	739.00
Manning, Maxwell & Moore.....	1,110.00
R. A. Robbins.....	868.90
S. C. Forsaith Machine Company.....	900.75
Class 40. Circular-saw mill :	
*Lane Manufacturing Company.....	2,150.00
S. C. Forsaith Machine Company.....	2,367.80
Class 41. Band sawing-machine :	
*J. W. Soper.....	1,690.00
Class 42. Log-canter, etc. :	
*Niles Tool Works.....	370.00
George Place.....	608.00
R. A. Robbins.....	409.40
S. C. Forsaith Machine Company.....	416.50
Class 43. Timber planer :	
Niles Tool Works.....	1,997.00
D. F. Walker.....	1,499.93

<b>Class 43. Timber planer—Continued.</b>	
George Place.....	\$1,350.00
Goodell & Waters.....	1,550.00
Manning, Maxwell & Moore.....	1,615.00
R. A. Robbins.....	1,823.00
*S. C. Forsaith Machine Company.....	1,537.50
<b>Class 44. Mast roll:</b>	
*Niles Tool Works.....	3,790.00
William Sellers & Co.....	5,330.00
Bement, Miles & Co.....	4,875.00
The Universal Radial Drill Company.....	3,750.00
<b>Class 45. Molding machine:</b>	
Niles Tool Works.....	256.00
George Place.....	429.00
Manning, Maxwell & Moore.....	395.00
R. A. Robbins.....	389.00
*S. C. Forsaith Machine Company.....	384.50
<b>Class 46. Portable balancing voltmeter, etc.:</b>	
*Electro Dynamic Company.....	499.17
<b>Class 47. Edison lamps, etc.:</b>	
*Electro Dynamic Company.....	865.08
R. A. Robbins.....	948.10
<b>Class 48. Supplying and placing two electric-wire circuits:</b>	
*Electro Dynamic Company.....	1,480.00
<b>Class 49. Shunt wound-drill motor:</b>	
*Electro Dynamic Company.....	1,550.00
<b>Class 50. Edco shunt wound-drill motors:</b>	
*Electro Dynamic Company.....	2,520.00
<b>Class 51. Shunt wound drill motor:</b>	
*Electro Dynamic Company.....	350.00

*Schedule of proposals for tools required for the United States Navy-Yard, Norfolk, Va., 1889.*

<b>Class 1. Bending-rolls:</b>	
*Niles Tool Works.....	\$21,527.00
William Sellers & Co.....	29,923.00
Bement, Miles & Co.....	29,870.00
<b>Class 2. Jib-cranes:</b>	
Bement, Miles & Co.....	1,200.00
*A. Box & Co.....	600.00
Manning, Maxwell & Moore.....	1,250.00
S. C. Forsaith Machine Company { A.....	1,262.50
B.....	1,150.00
George Place { A.....	1,248.00
B.....	1,098.00
<b>Class 3. Band-saw mill:</b>	
D. F. Walker.....	4,799.90
Niles Tool Works.....	5,885.00
*Bass Foundry and Machine Works.....	5,534.00
S. C. Forsaith Machine Company.....	5,775.00
George Place.....	5,849.00
<b>Class 4. Westinghouse automatic compound engine:</b>	
D. F. Walker.....	2,000.00
*Manning, Maxwell & Moore.....	2,168.00
S. C. Forsaith Machine Company.....	2,187.00
<b>Class 5. Cut-off saw:</b>	
Niles Tool Works.....	521.00
*S. C. Forsaith Machine Company.....	487.50
George Place.....	549.00
<b>Class 6. Sand-papering machine:</b>	
D. F. Walker.....	499.93
Niles Tool Works.....	535.00
*George Place.....	569.00
<b>Class 7. Portable hydraulic ship-riveter:</b>	
*Niles Tool Works.....	4,250.00

## Class 8. Hand-taps:

J. W. Soper.....	{ \$204.000
The Pratt and Whitney Company.....	255.000
Manning, Maxwell & Moore.....	294.00
*R. A. Robbins.....	109.00
S. C. Forsaith Machine Company.....	68.70
	235.24

## Class 9. Nine-wheel grinder:

*J. W. Soper.....	244.92
Manning, Maxwell & Moore.....	245.00
S. C. Forsaith Machine Company.....	254.40

## Class 10. Morse taper twist-drills:

J. W. Soper.....	94.78
Manning, Maxwell & Moore.....	105.95
*R. A. Robbins.....	103.00
S. C. Forsaith Machine Company.....	115.90

## Class 11. Miscellaneous:

*R. A. Robbins.....	256.90
S. C. Forsaith Machine Company.....	291.50

## Class 12. Westinghouse standard automatic engine:

D. F. Walker.....	480.00
*Manning, Maxwell & Moore.....	480.00
S. C. Forsaith Machine Company.....	499.00

## Class 13. Shafting, hangers, couplings, collars, pulleys:

Niles Tool Works.....	1,392.21
*William Sellers & Co.....	1,201.63
A Flagler.....	1,524.17
Manning, Maxwell & Moore.....	1,631.88
R. A. Robbins.....	1,481.54
S. C. Forsaith Machine Company.....	1,440.95
George Place.....	1,417.41

*Schedule of proposals received for steel, about 611 tons of protective-deck plates, required for use in the construction of the United States armored battle-ship Texas, under the Department's advertisement of August 6, 1889.*

Linden Steel Company.....	\$116,970.56
Carnegie, Phipps & Co.....	125,854.40

*Schedule of proposals for steel plates for use in the construction of the United States armored cruiser Maine, at the Navy-Yard, Brooklyn, N. Y., opened at Navy Department, July 8, 1889.*

*Linden Steel Company.....	\$34,753.60
Carnegie, Phipps & Co.....	38,348.80

*Proposals for furnishing or for constructing by contract four steam-tugs for the United States Navy.*

## Tug for Navy-Yard, Washington, D. C.

## For furnishing:

A. Booth Packing Company, for one tug.....	\$23,500.00
P. Dougherty & Co., for one tug.....	33,000.00
*Same company, for one tug.....	35,000.00
Same company, for one tug.....	31,000.00

## For constructing:

Neafie & Levy, for one tug.....	32,990.00
The Hohenstein Manufacturing Company, for one tug.....	34,000.00
The Atlantic Works, for one tug.....	32,978.00

## Tug for Navy-Yard, League Island, Pa.

## For constructing:

Neafie & Levy, for one tug.....	32,490.00
The Hohenstein Manufacturing Company, for one tug.....	34,000.00
Same company, for one tug.....	34,000.00

*Schedule of proposals for steel required for use in the construction of cruiser No. 7, opened at the Navy Department, October 31, 1889.*

Class A.—Steel plates:	
* Carnegie, Phipps & Co.	\$65,856.00
Linden Steel Company	71,500.80
Class B.—Steel plates:	
* Carnegie, Phipps & Co.	30,856.00
* Linden Steel Company	27,664.00
Class C.—Wrought steel:	
* Bethlehem Iron Company	7,476.00
Class D.—Steel shapes:	
* Carnegie, Phipps & Co.	20,160.00
Class E.—Steel rivets:	
* Oliver Iron and Steel Company	7,840.00
Class F.—Steel castings:	
* Standard Steel Casting Company	31,606.40

*Schedule of proposals for steel required for use in the construction of cruiser No. 8, opened at the Navy Department, October 31, 1889.*

Class A.—Steel plates:	
* Carnegie, Phipps & Co.	\$65,856.00
Linden Steel Company	71,500.80
Class B.—Steel plates:	
* Carnegie, Phipps & Co.	30,856.00
* Linden Steel Company	27,664.00
Class C.—Wrought steel:	
* Bethlehem Iron Company	7,476.00
Class D.—Steel shapes:	
* Carnegie, Phipps & Co.	20,160.00
Class E.—Steel rivets:	
* Oliver Iron and Steel Company	7,840.00
Class F.—Steel castings:	
* Standard Steel Casting Company	31,606.40

*Schedule of proposals for materials required for use in the construction, at the Navy-Yard, Brooklyn, N. Y., of the machinery for two cruisers of about 3,000 tons displacement each; opened at Navy Department, November 6, 1889.*

Class 35.—Pattern-maker's lumber:	
* Watson & Pittenger	\$2,006.00
John Kenny	2,189.00
J. W. Duryee	2,150.00
Class 38, A.—Finished steel shafting:	
Midvale Steel Company	75,018.60
* Bethlehem Iron Company	31 cts. per lb.
Same class.—Rough-turned steel shafting:	
Midvale Steel Company	62,232.30
Bethlehem Iron Company	28½ cts. per lb.
Class 38, B.—Corrugated steel furnaces:	
* Continental Iron Works	36,080.00
Class 38, C.—Condenser tube sheets and packing:	
* D. B. Cobb	4,900.00
B. H. Cramp & Co.	7,000.00
Class 39, A.—Anti-friction metal:	
* J. J. Donovan	900.00
R. A. Robbins	1,095.00
B. H. Cramp & Co.	1,245.00
Deoxidized Metal Company	1,200.00
Class 39, B.—Pig Tin:	
William A. Wheeler	2,700.00
* R. A. Robbins	2,390.00
Class 39, C.—Steel Castings:	
* Standard Steel Casting Company	35,840.00

Class 44, C.—Steel rods, shapes, and forgings for boiler bracing:	
Midvale Steel Company .....	\$31,360.00
Class 44, D.—Steel engine forgings:	
* Midvale Steel Company .....	65,577.60
Bethlehem Iron Company .....	<div> <div>{</div> <div>35 cts. per lb.</div> </div>
	<div> <div>{</div> <div>20 cts. per lb.</div> </div>
	<div> <div>{</div> <div>36 cts. per lb.</div> </div>
Class 53, A.—Boiler tubes:	
* William A. Wheeler .....	15,489.33
George A. Taylor .....	16,718.33
S. C. Forsaith Machine Company .....	21,886.21
Class 53, B.—Condenser tubes:	
William A. Wheeler .....	13,206.69
American Tube Works .....	11,405.35
Benedict & Burnham Manufacturing Company .....	6 <sup>10</sup> / <sub>100</sub> cts. per ft.
Ansonia Brass and Copper Company .....	6 <sup>10</sup> / <sub>100</sub> cts. per ft.
	11,405.32
Class 56.—Steel rivets:	
* Oliver Iron and Steel Company .....	5,040.00

## No. 2.—DETAILED MOVEMENTS OF VESSELS.

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### NORTH ATLANTIC STATION.

The squadron on this station is now under the command of Rear-Admiral Bancroft Gherardi, who succeeded Rear-Admiral Stephen B. Luce. The vessels composing it are the *Galena*, *Kearsarge*, *Yantic*, and *Dolphin*. The *Kearsarge* and *Dolphin* have been added to the command since last report, the *Atlanta* and *Pensacola* detached for other duty, and the *Ossipee* put out of commission.

#### GALENA.

The *Galena* (flag-ship), after undergoing repairs at the navy-yard, New York, sailed from that place, accompanied by the *Yantic*, for Port au Prince, Hayti, December 12, 1888, to recover the American steamer *Haytien Republic*, which vessel had been seized by the Haytian authorities for alleged violation of the blockade. The *Galena* arrived at Port au Prince December 20, and a few days later the *Haytien Republic* was surrendered to the force under Rear-Admiral Luce. The *Galena* sailed for Port Royal, Jamaica, January 1, 1889, and arrived at that port the next day. Left January 12, and returned to Port au Prince on the 14th. Sailed again January 16, and arrived at Key West three days later. She remained at this port until the 17th of February, when she sailed for Cape Haytien, where she arrived February 21. From this time until May 18 following she was actively employed in Haytian waters, visiting at different times St. Marc, Gonaives, St. Nicholas Mole, and Port au Prince, upon which date she sailed from Cape Haytien for Key West, where she arrived May 21. Sailed thence May 24, and reached New York on the 29th of that month. She remained at New York until August 25, when she again sailed for Haytian waters. She arrived at St. Nicholas Mole September 4, and sailing thence the next day visited Cape Haytien, St. Nicholas Mole, Port au Prince, and arrived at Gonaives September 21. A riot having occurred on the island of Navassa, she left for that place October 4 and arrived there two days later. Having investigated the cause of the riot, and after securing nine of the ring-leaders, she proceeded thence to Baltimore, Md., via Kingston, Jamaica, and reached Baltimore October 25, where the nine men were turned over to the custody of the United States marshal. Left Baltimore October 29 and arrived at New York on the 31st of that month.

#### KEARSARGE.

The *Kearsarge* arrived at Porto Grande, Cape de Verde Islands, December 25, 1888. Sailed December 29 for Montevideo, and arrived January 24, 1889. Left for the United States February 15, and arrived at Hampton Roads April 12, having touched at Barbadoes en route.

Sailed April 18, and arrived at New York the following day. June 12, 1889, she was assigned to duty on the North Atlantic station. She sailed from New York on the 16th of that month, and arrived at Cape Haytien June 25. From this date until the 11th of September she remained in Haytian waters, visiting and revisiting the following-named ports: St. Nicholas Mole, Port au Prince, Gonaives, and Cape Haytien. Sailing from the latter port September 11, she arrived at New York September 17. Sailed for Port au Prince October 1 with Mr. Douglass, the United States minister to the Haytian Republic, and party on board. Arrived at Port au Prince October 8. Sailed the same day and arrived at the Delaware Breakwater October 22 and New York October 27.

#### YANTIC.

The *Yantic* sailed from New York December 12, 1888, for Port au Prince, where she arrived December 20. Sailed thence December 23, and reached Santiago de Cuba the next day, where she remained until December 27, when she again sailed for Port au Prince and arrived at that place December 28. Yellow fever having made its appearance on board she left January 1, 1889, for New York, and reached the quarantine station, that port, January 12, and the navy yard January 22. After being thoroughly fumigated and disinfected, she left New York May 11 to destroy certain derelicts on the Atlantic coast. She touched at Delaware Breakwater May 13, and left the next day. She returned to New York May 24, having lost her fore, main, and mizzen top-mast, jibboom, and four boats in a cyclone encountered May 21. After undergoing repairs at the New York Yard she sailed from that place September 5 for Baltimore, to participate in the ceremonies attending the centennial anniversary of the bombardment of Fort McHenry and battle of North Point. She arrived at Baltimore September 9, remaining at that port until the 15th, when she sailed for Norfolk, where she arrived on the 17th, leaving there for Hampton Roads November 4. She sailed November 6 for Santiago de Cuba with expedition for determining certain longitudes in the West Indies.

#### OSSIPEE.

The *Ossipee* having completed her repairs left the navy-yard, Norfolk, January 6, 1889, and sailed for the West Indies the following day; arrived at Port au Prince January 14, and left on the afternoon of the 15th for Port Royal, Jamaica, with the steamer *Haytien Republic* in tow, arriving there January 17. On the 19th of January the *Haytien Republic* was formally turned over to the agent for her owners. The *Ossipee* sailed for Aspinwall January 23, and arrived at that port on the 28th. She remained at Aspinwall until March 3, when she left for Port Royal, where she arrived March 7. Leaving on the 11th, she visited Kingston, and returned to Port Royal March 12. Sailed the same day for Cape Haytien, and reached that port two days later. She remained in Haytian waters until April 24, visiting at different times the following-named ports: St. Marc, Gonaives, St. Nicholas Mole, Port Paix, and Cape Haytien. She left the latter port April 24 for Havana, where she arrived April 28. After a visit of two days she left for Key West, arriving May 1. Leaving the latter port May 9, she arrived at Hampton Roads May 14. Left the 19th, and arrived the same day at Norfolk, Va. Left Norfolk May 25, and arrived at St. Nicholas Mole June 2. From this date until the 2d of August she was actively employed in Haytian waters, when she sailed from Port au Prince for



Port Royal, and reached the latter place August 4. After a stay of two days at Port Royal she left for Cay Arenas, and reached that place August 11, and rescued two of the survivors left on the Cay by the American schooner *Anna*. She left the same day, and arrived at Key West August 15. Sailed on the 16th, and arrived at Hampton Roads August 21. Went to Norfolk August 23, remained in that port until August 30, when she returned to Hampton Roads. Left September 4, and arrived the next day at Baltimore, Md., to participate in the centennial ceremonies of the bombardment of Fort McHenry and battle of North Point. She remained at Baltimore until September 23, when she left for Norfolk, and arrived at that port September 26. Was put out of commission November 12, 1889.

#### DOLPHIN.

The *Dolphin* sailed January 22, 1889, from Honolulu, Hawaiian Islands, for the United States, via the Asiatic and European stations, and arrived at Yokohama on the 13th of February following. Leaving that port on the 26th of that month she visited Kobe, Chemulpo, Nagasaki, Chin-Kiang, Wu-Hu, Hong-Kong, Singapore, Colombo, Bombay, Aden, Suez, Alexandria, Naples, Leghorn, Genoa, Villefranche, Toulon, Marseilles, Barcelona, Gibraltar, Plymouth, Funchal, and Bermuda, and arrived at New York September 27. She was assigned to the North Atlantic station November 19, 1889.

#### ATLANTA.

The *Atlanta* having been again temporarily assigned to the North Atlantic station sailed from New York January 21, 1889, for Haytian waters and arrived at Cape Haytian on the 28th of that month. Sailed thence February 1; visited Port Royal, Jamaica, and arrived at Aspinwall February 5. She remained in this port until April 9. Leaving on that day she visited Kingston, St. Marc, Gonaïves, and Cape Haytian, which port she left April 21 and arrived at New York April 28, and reached the navy-yard at that place the next day. Sailed August 3 for Newport, arriving there the next day. Left August 7 and returned to the New York yard on the 11th. Leaving again September 9 she went to Newport and returned to the New York yard October 5.

#### PENSACOLA.

The *Pensacola* remained at the navy-yard, Norfolk, undergoing repairs until September 7, 1889, when she sailed for Baltimore to participate in the centennial ceremonies attending the bombardment of Fort McHenry and battle of North Point. She arrived at Baltimore September 8, left on the 16th of the same month, and arrived at New York two days later. She sailed for St. Paul de Loando, western coast of Africa, October 16, with expedition to observe the eclipse of the sun December 22.

#### SOUTH ATLANTIC STATION.

The South Atlantic station remains under the command of Acting Rear-Admiral James H. Gillis, and at present consists of the *Richmond* and *Tullapoosa*. The *Richmond* has been added to the command since last report. The *Alliance* has returned home and been put out of commission, and the *Swatara* detached from the squadron and ordered to the Asiatic station.

## RICHMOND.

The *Richmond* left the navy yard, New York, December 26, 1888, arrived at Hampton Roads two days later, and went up to the navy-yard, Norfolk, December 31. She left the yard January 2, 1889, and anchored the same day at Hampton Roads. The following day she sailed for the South Atlantic station. She arrived at St. Vincent, Cape de Verde Islands, January 31, where she remained until February 5, when she left for Montevideo, arriving at that port March 8. Sailed March 23, arrived at Maldonado the same day and returned to Montevideo April 4. She again visited Maldonado April 24 and returned to Montevideo May 8. Left May 20 and arrived at Buenos Ayres the next day. She remained at this port until August 9, when she sailed for La Plata, where she arrived August 12. After a visit of five days she proceeded to Colonia, and reached that place August 18. Sailed August 30th and arrived at Montevideo on the 31st. Left September 11th and arrived at Buenos Ayres on the 13th of that month.

## ALLIANCE.

The *Alliance* sailed from Montevideo October 8 and arrived at Rio de Janeiro October 14. She remained at this port until November 22, when she left for Pernambuco, arriving there December 4. Sailed December 6 and arrived at Bahia December 9. Left the latter port December 10 and arrived at Montevideo the 27th of the same month. She remained at this port until February 27, 1889, when she sailed for Maldonado, and arrived there the same day. Returned to Montevideo March 2, and after remaining at this port until the 2d of April, she again left for Maldonado, and reached that place the next day and Montevideo on the 5th. Left April 25, visited Colonia and Buenos Ayres and returned to Montevideo May 14. Sailed again May 18 and arrived at Pernambuco June 6, and on the 20th of that month left for Hampton Roads, arriving at that place July 18. Went up to the navy-yard, Norfolk, Va., August 9, and was put out of commission August 20, 1889.

## TALLAPOOSA.

The *Tallapoosa* sailed from Montevideo October 16, 1888, and arrived at Maldonado October 20. Sailed thence October 24 and arrived at Montevideo October 29. Left December 20 and arrived at Colonia the next day. She remained at that port until January 14, 1889, when she sailed for Montevideo, arriving there the next day. Left again March 1 and arrived the same day at Maldonado, from which port she sailed on the 5th and returned to Montevideo the same day. Went to Maldonado again on the 10th and remained there until the 23rd, when she left for Lobos Island, where she arrived the same day, returning to Maldonado on the 26th of March. After remaining there until April 3, she left for Montevideo and arrived the next day. Sailed April 20 and visited Buenos Ayres, Martin Garcia, Dos Hermanos, Rosario, Anna Maria, La Paz, Bella Vista, Corrientes, Asuncion, Santa Elena, San Nicolas, and arrived at Buenos Ayres July 8. Left August 1 and arrived the same day at Montevideo. Leaving that port August 8, she visited Buenos Ayres, La Plata, Colonia, New Palmyra, Fray Bentos, New Berlin, Conception, Paysandu, and arrived at Buenos Ayres September 21. Left on the 26th, and arrived at Montevideo the next day.

## SWATARA.

The *Swatara* sailed from Maldonado November 27 and arrived at Montevideo the same day. She remained at the latter port until December 19, when she left for Sandy Point, Straits of Magellan, arriving there December 29. On the 2d of January, 1889, she proceeded to the Falkland Islands and arrived at Port Stanley on the 8th of the same month, and after a visit of one week she left for Montevideo, where she arrived January 21. February 27 she left for Maldonado, and reached that place March 2, returning the same day to Montevideo. She remained at this port until March 11, when she sailed for the Asiatic station.

## PACIFIC STATION.

The Pacific squadron continues under the command of Rear-Admiral L. A. Kimberly, and consists of the *Alert*, *Adams*, *Mohican*, *Iroquois*, *Nipsic*, *Pinta*, and store-ship *Monongahela*. Since last report the *Trenton* and *Vandalia* have been totally wrecked, the *Dolphin* detached from the squadron, and the *Iroquois* added.

## ALERT.

The *Alert* left Honolulu February 22, 1889, for a cruise around the Hawaiian Islands, stopped two days at Hilo, and returned to Honolulu March 2. April 18 she sailed for Apia, Samoa, where she arrived May 3. She remained at this port until May 9, when she sailed for Auckland, as convoy to the *Nipsic*. Both vessels, however, returned to Apia May 15 and sailed the same day for Pago Pago, reaching that place May 16. Sailed again, in company with the *Nipsic*, May 31. Touched at Fanning Island June 14, leaving the *Nipsic* at this port, and arrived at Honolulu June 25. Sailed again on the 8th of July and arrived at Fanning Island July 14. Left this port in company with the *Nipsic* and reached Honolulu August 2.

## ADAMS.

The *Adams* continued in active employment in Samoan waters until December 6, 1888, when she sailed for San Francisco. Touching at West Cape and Honolulu, she arrived at San Francisco January 30, 1889. Went up to navy-yard, Mare Island, and was put out of commission March 25. She was again commissioned April 22, at the navy-yard, Mare Island, and left that place for San Francisco June 14, and the latter port on the 18th for Honolulu, where she arrived July 4. She sailed for Apia August 4 and arrived there on the 20th of the month. Sailed the same day for Pago Pago and returned to Apia August 22, having towed the *Monongahela* out of port and into Apia. Sailed again for Pago Pago August 25, and returned to Apia September 8.

## MOHICAN.

The *Mohican* sailed for Panama February 7, 1889, and arrived there March 4, having touched at Acapulco en route. Leaving Panama April 18 and stopping at Cape Pasado, Bahia de Caraquez, Salango Island, Manta, and Point St. Elena, reached Payta, Peru, May 3. Sailed thence and arrived at Callao July 8, which port she left September 12 and reached Honolulu October 14.

## NIPSIC.

The *Nipsic* arrived at Apia, Samoa, November 7, 1888. She was beached during the hurricane in that harbor March 16, 1889, and sustained severe damage. She left for Auckland for repairs May 9, conveyed by the *Alert*, but returned to Apia May 15, after an unsuccessful attempt to reach that port. She sailed the same day for Pago Pago, reaching there the 16th and leaving May 31 for Honolulu under convoy of the *Alert*. She arrived at Fanning Island June 14 and at Honolulu August 2, where the vessel has been repaired and put in condition to continue her cruise.

## IROQUOIS.

The *Iroquois* was put in commission at the navy-yard, Mare Island California, June 19, 1889. Went to San Francisco September 5, and sailed from that port for Honolulu on the 15th of that month. She arrived at Honolulu October 14.

## PINTA.

The *Pinta* was employed in Alaskan waters until April 10, 1889, when she sailed for the navy-yard, Mare Island, for repairs, and reached that place April 29. Left again for Alaskan waters October 6, and arrived at Sitka October 17.

## MONONGAHELA.

The *Monongahela*, after receiving stores and supplies for the Pacific squadron, sailed from the navy-yard, Mare Island, for the Samoan group, February 21, 1889, and arrived at Apia April 6. Sailed the next day for Pago Pago, and arrived there April 8. She remained at this port until August 21, when she sailed for Apia, reaching that place on the 22d. Sailed for San Francisco September 13; arrived at that port October 28.

## DOLPHIN.

The *Dolphin* left Corinto November 28, 1888, and arrived at Panama December 1, having touched at Punta Arenas en route. Sailed December 18 and arrived at Acapulco December 25, which port she left on the 28th for Honolulu, where she arrived January 12, 1889. She sailed for New York, via the Asiatic and European stations, January 22.

## TRENTON.

The *Trenton* left Payta, Peru, December 2, 1888, for Panama, where she arrived December 7. Sailed January 13, 1889, for the Samoan Islands. Arrived at Tahiti February 22. Left that place March 1 and arrived at Apia, Samoa, March 10. She was totally wrecked in that harbor March 16, 1889, during a severe hurricane.

## VANDALIA.

The *Vandalia* sailed from the navy-yard, Mare Island, for the Samoan Islands January 20, 1889. Arrived at Honolulu February 2. Left that port on the 7th, and arrived at Apia February 22. She was totally wrecked in that harbor March 16, 1889, during a severe hurricane.

## ASIATIC STATION.

Rear-Admiral George E. Belknap assumed command of the squadron on this station April 4, 1889, succeeding Rear-Admiral Ralph Chandler, who died at Hong-Kong February 11, 1889. The vessels composing this command are the *Omaha*, *Marion*, *Palos*, *Swatara*, and *Monocacy*. The *Brooklyn*, *Juniata*, and *Essex* have returned to the United States and been put out of commission.

## OMAHA.

The *Omaha* sailed from Shanghai, China, January 29, 1889, visited Nagasaki, and arrived at Chemulpo February 8. Left that port the next day and arrived at Shanghai on the 19th, having touched at Chin Kiang en route. Sailed March 5, visited Nagasaki and Kobe, and arrived at Yokohama on the 27th of that month. She remained at that port until August 3, when she went to the dock-yard at Yokosuka and returned to Yokohama August 8. Left September 5, arrived at Kobe September 7; sailed September 19 and arrived at Nagasaki two days later.

## MARION.

The *Marion* sailed from Shanghai February 4, 1889, and arrived at Hong-Kong February 10. Leaving February 23 and touching at Amoy, she arrived at Shanghai March 4. She left that port on the 22d of that month and arrived at Nagasaki two days later. She remained at that port until April 4, when she sailed for Yokohama, where she arrived April 7. Left April 24, arrived at Kobe on the 26th, and reached Nagasaki May 3. From the latter port she sailed June 8, and arrived at Yokohama on the 12th of that month. Leaving this port July 15, she visited Kobe, and arrived at Nagasaki July 27, from which port she sailed August 3 and reached Chemulpo August 6.

## PALOS.

The *Palos* arrived at Tien Tsin October 24, and went into winter quarters at that place. Sailed March 7, 1889, upon the re-opening of navigation, and arrived at Chefoo March 11. Sailed from that port on the 14th, and arrived at Chemulpo March 16. She remained at that port until August 8, when she sailed for Nagasaki, where she arrived August 11. Sailed thence on the 17th of the same month, and arrived at Kobe August 20, having touched at Nak-Sima and Yarumi-no-Ura en route. Remaining in this port until September 19, she sailed that day for Nagasaki, where she arrived September 24, having touched at Matsuhama and Gogo Sima.

## MONOCACY.

The *Monocacy* has remained at Yokohama since last report. She has recently been thoroughly repaired and refitted and is now again in condition for active service on the station.

## SWATARA.

The *Swatara* sailed from Montevideo for the Asiatic station March 11, 1889; visited Cape Town, Tulleur Bay, Morondava, Mozambique, Johanna, Tamatave, Zanzibar, Singapore, and arrived at Hong-Kong October 30, 1889.

## ESSEX.

The *Essex* left Chemulpo October 20, and arrived at Tung-Chan-fu October 22. Sailed thence October 27, and arrived at Shanghai October 31, having touched at Chefoo en route. Sailed January 3, 1889, for New York; arrived at Hong-Kong January 7, Singapore January 15, Colombo January 25, Aden February 9, Suez February 20, Port Said February 26, Malta, March 7, Gibraltar, March 18, Madeira, March 26, and reached New York April 24. Was put out of commission May 11, 1889.

## BROOKLYN.

The *Brooklyn* arrived at St. Thomas, West Indies, March 31, 1889. Sailed thence April 7, and arrived at New York April 24. Was put out of commission at that place May 14, 1889.

## JUNIATA.

The *Juniata* sailed from Alexandria, Egypt, December 3, 1888; arrived at Villefranche December 13, having stopped at Naples en route. Left December 17, arrived at Gibraltar December 23, Madeira December 31, St. Thomas January 22, 1889, and New York February 4. Was put out of commission at that place February 28, 1889.

## EUROPEAN STATION.

The force on this station has been under the command of Commander B. H. McCalla, commanding the U. S. S. *Enterprise*, since the detachment of Acting Rear, Admiral James A. Greer, June 24, 1889.

The *Enterprise* is now the only United States vessel of war on the station, the *Lancaster* and *Quinnebaug* have been detached from the squadron since last report.

## ENTERPRISE.

The *Enterprise* sailed from Rouen November 2, 1888, and visited the following ports: Le Trait, Plymouth, Paulliac, Bordeaux, Lisbon, Cadiz, and Gibraltar, arriving at the last-named place December 23. She remained at Gibraltar until January 8, 1889, when she sailed and visited Negro Bay, Morocco, and Malaga, and returned to Gibraltar January 19. Sailing again on the 23d, she arrived at Villefranche January 29. She remained at that port until March 7, when she sailed for Naples, en route to Zanzibar and Madagascar. She arrived at Naples March 10. Proceeding thence three days later she touched at Port Said, Suez, Aden, and arrived at Tamatave, Madagascar, April 11. Leaving the latter place, she visited Nosi Vei, Belo, Morundava, and Mozambique, and arrived at Zanzibar May 1. She remained at this port until May 18, when she left for the European station; arrived at Aden May 26, Suez June 4, Port Said June 5, Leghorn June 13, and Villefranche on the 25th of the same month. She sailed the next day, and arrived at Gibraltar June 30. Left July 1, touched at Cherbourg, and arrived at Southampton July 9. She remained at this port until August 5, when she sailed, visited Cowes, and returned to Southampton August 13. Proceeding thence on the 24th, she visited Portland, Plymouth, Carrickfergus, Greenock, Wemyss Bay, and Inver-

array, and arrived at the Mull of Galloway September 26. Left September 30, visited Holyhead and Bristol, and arrived at Brixham Roads October 31.

#### LANCASTER.

The *Lancaster* sailed from Villefranche December 24 and arrived at Genoa the following day. She remained at this port until January 1, 1889, when she left and returned to Villefranche. Sailing from this port May 4, she again visited Genoa, arriving there May 5. Sailed thence for New York May 13; arrived at Spezia May 14, Leghorn May 22, Gibraltar July 2, Madeira July 10, and reached New York August 8. Was put out of commission at that place September 7, 1889.

#### QUINNEBAUG.

The *Quinnebaug* sailed from Constantinople November 15, 1888, visited Smyrna, Beirut, and arrived at Alexandria November 27, at which port she remained until April 10, 1889, when she sailed for Malta, arriving there April 16. Left April 21 and arrived at Villefranche April 24. Sailed for Gibraltar May 1, and arrived at that port May 6. Sailed thence for New York May 9; arrived at Madeira May 12, and reached New York June 17. Was put out of commission at that place July 3, 1889.

#### APPRENTICE TRAINING SQUADRON.

##### JAMESTOWN.

The *Jamestown* was put in commission at the navy-yard, Norfolk, Va., April 13, 1889, and sailed for New York on the 22d of the same month, arriving there on the 25th. Sailed for Newport May 7, arriving there May 9. She remained at Newport until the 5th of June, when she proceeded to sea for the usual summer cruise. Arrived at Cherbourg, France, July 1, 1889; sailed thence for Cadiz, and arrived at that place August 2; sailed August 7; visited Tangiers on the 9th, sailing the same evening for Gibraltar, where she arrived the next day. Left August 14, and arrived at Madeira August 19. From this port she sailed direct for Newport and reached that place October 6.

##### PORTSMOUTH.

The *Portsmouth* was put in commission at the navy-yard, Portsmouth, N. H., July 10, 1889, and sailed from that port August 6 for her summer cruise. Arrived at Fayal, Western Islands, August 22, where she remained until the 27th of that month, when she sailed for Funchal, Madeira, reaching that port September 5. After a visit of two weeks she sailed for Newport, and arrived October 28. Left for New York November 11 in tow of the tug *Nina*, and reached that place the next day.

##### CONSTELLATION.

The *Constellation* arrived at Barbadoes December 2, 1888. She remained at this port one month, when she sailed for Port of Spain, Trinidad, arriving January 8, 1889. Left February 18, arrived at Basse Terre February 28, and sailed thence March 11, and arrived at St.

Thomas on the 13th of that month. On the 20th of March she sailed for Hampton Roads, arriving April 4, and at the navy-yard, Norfolk, April 9. Here she transferred the majority of her officers and crew to the *Jamestown*, and sailed for Annapolis April 25, and arrived at that port April 30, when she was turned over to the Superintendent of the Naval Academy.

#### SPECIAL SERVICE.

The vessels on special service are the *Ranger*, *Despatch*, *Michigan*, and *Thetis*.

##### RANGER.

The *Ranger* returned to the navy-yard, Mare Island, California, June 26, 1889, and, after undergoing slight repairs, sailed from that place November 6 to resume her work on the coast of Lower California.

##### DESPATCH.

The *Despatch* has been employed during the year on the North Atlantic coast, and has visited at different times the following-named ports: Norfolk, Washington, Annapolis, Philadelphia, New York, Elizabethport, Newport, Boston, Portsmouth, and Bar Harbor, and is at present at the navy-yard, Washington, D. C.

##### MICHIGAN.

The *Michigan* has been employed during the past year on the north-western lakes.

##### THETIS.

The *Thetis* sailed from the navy-yard, Mare Island, California, April 20, 1889, and arrived at Sitka June 2, having touched at Tacoma, Port Simpson, Fort Tongass, Port Chester, and Wrangell. She remained at Sitka until June 8, when she sailed for Ounalaska and ports to the northward; arrived at Ounalaska June 17. Sailing thence on the 24th she visited St. Paul Island, St. Matthew's Island, Plover Bay, Cape Tchaplín, St. Lawrence Bay, Point Hope, St. Michael's, Port Clarence, Cape Tichiboukak, Cape Prince of Wales, Cape Blossom, and arrived at Point Barrow July 29. She left this place August 8, touched at Cross Island, Collenson Point, Herschel Island, Mackenzie Bay, and returned to Point Barrow August 24. Left on the 31st of that month; visited Point Lay, Icy Cape, Point Hope, and arrived at Ounalaska September 26. She left that port October 3, and arrived at Sitka October 10. She is now under orders to the navy-yard, Mare Island, California.

#### SQUADRON OF EVOLUTION.

This squadron, created under the Department's order of September 30, 1889, is composed of the *Chicago*, *Boston*, *Atlanta*, and *Yorktown*, and is under the command of Acting Rear-Admiral John G. Walker.

##### CHICAGO.

The *Chicago* was put in commission at the navy-yard, New York, April 17, 1889. Sailed for Newport September 4 for speed and turning



trials, and returned to New York September 23. Sailed for Boston, accompanied by the vessels of the squadron, November 18. Anchored at Sandy Hook and Provincetown, and arrived at Boston November 22.

#### BOSTON.

The *Boston* remained at the navy-yard, New York, until May 15, 1889, when she sailed for the navy-yard, Norfolk, Va., reaching that place May 17. Left on the 18th, with the Monitor *Puritan* in tow, and arrived at the navy-yard, New York, May 21. Sailed July 4, arrived at the navy-yard, League Island, the next day, and, taking the *Amphitrite* in tow, left July 6 and arrived at Norfolk on the 8th of that month. Leaving the next day, she arrived in New York July 10. From thence she left, July 29, for Newport for speed and turning trials, and returned to New York August 5. She was assigned to this squadron, September 30, 1889. She sailed for Boston with the other vessels of the squadron November 18, and reached there November 22, having touched at Sandy Hook and Provincetown.

#### ATLANTA.

The *Atlanta* was assigned to this squadron September 30, 1889, and accompanied the other vessels of the command from New York to Boston.

#### YORKTOWN.

The *Yorktown* was put in commission at the navy-yard, League Island, Pa., April 23, 1889, and left for New York two days later, arriving there April 28. Went to sea for final trial July 27, and returned to New York July 29. Sailed August 13, and arrived at Newport on the 16th, having visited New London en route. Having completed her speed and turning trials, etc., she sailed from that port September 25, and reached New York the next day. Left October 2; arrived at West Point the same day, and returned to New York October 5. She was assigned to duty with this squadron September 30, 1889, and accompanied the other vessels of the command from New York to Boston.

**No. 3.—SALES OF GOVERNMENT PROPERTY.**

*Statement of deposits on account of sales of Government property, Navy Department, from November 1, 1888, to November 1, 1889.*

(Compiled in the Fourth Auditor's Office, by direction of the Secretary of the Treasury.)

Date of deposit.	Place of deposit.	By whom deposited.	Nature of property sold.	Amount covered to miscellaneous receipts.	Amount credited to the appropriation.	Total amount deposited.	Remarks.
1888.							
Nov. 7	New York United States Treasury	A. Burtis, paymaster. M. Seward, Chief Bureau of Ordnance.	Sale of floating derrick. Cost of pecking articles for Cincinnati exposition.	\$1,061.00	\$69.70	\$1,061.00	Bureau of Steam-Engineering, Bureau of Ordnance.
10	Boston	C. W. Abbot, pay director	Condemned stores: Old docks, boats, pilot-houges, wire rope, iron steam-pumps, hydraulic punches, barometers, monitor compasses, etc.	6,621.82		6,621.82	Bureau of Construction and Repair, \$1,668.04.
10	do	do	do				Bureau of Equipment and Recruiting, \$765.92.
10	do	do	do				Bureau of Yards and Docks, \$368.88.
10	do	do	do				Bureau of Steam-Engineering, \$331.30.
10	do	do	do				Bureau of Navigation, \$489.08.
10	do	do	do				Bureau of Ordnance.
13	United States Treasury	W. C. Whitney, Secretary of Navy.	Ordnance material and small arms.	16,000.00	2,064.96	18,064.96	
13	Philadelphia	G. Crookan, pay inspector.	Old vessels, set of March 3, 1883.			16,000.00	Bureau of Yards and Docks.
19	United States Treasury	H. B. Lowry, quartermaster.	Rent of wharf.	200.00		200.00	
19	Baltimore	U. S. Marine Corps T. T. Caswell, pay inspector	Cutter's clippings	180.99		180.99	
23	do	H. T. B. Harris, paymaster	Text-books, Manual of Ordnance and Gunnery.	4.52		4.52	Bureau of Navigation.
27	Philadelphia	W. J. Thomson, paymaster	Clothing furnished cadet store-keeper.		331.85	331.85	Bureau of Provisions and Clothing.
27	do	do	Condemned Government property.	20,026.00	10,880.61	30,906.61	Bureau of Yards and Docks, \$1,660.63.
27	do	do	do				Bureau of Navigation, \$372.85.
27	do	do	do				Bureau of Construction and Repair, \$8,515.42.
27	do	do	do				Bureau of Equipment and Recruiting, \$5,433.96.

**Bureau of Equipment**  
**crating, \$5,433.96.**

## REPORT OF THE SECRETARY OF THE NAVY.

Statement of deposits on account of sales of Government property, Navy Department, from November 1, 1888, to November 1, 1889—Continued.

Date of deposit.	Place of deposit.	By whom deposited.	Nature of property sold.	Amount covered to miscellaneous receipts.	Amount credited to the appropriation.	Total amount deposited.	Remarks.
1888.							
Nov. 27	Philadelphia.	W. J. Thomson, paymaster.	Condemned Government property.				Bureau of Steam-Engineering, \$1,988.16.
27	do.	do.	do.				Bureau of Provisions and Clothing, \$1,872.16.
27	do.	do.	do.				Bureau of Ordnance, \$9,068.73.
Dec. 4	United States Treasury	G. A. Bartlett, disbursing clerk.	Mattresses and blankets furnished <i>Spy</i> .		\$35.86	\$35.86	Bureau of Provisions and Clothing.
7	do.	J. G. Walker, chief Bureau of Navigation.	American ensign.		12.72	12.72	Bureau of Navigation.
10	New York	M. C. McDonald, passed assistant paymaster.	Condemned stores.	\$140.41	32.10	172.51	Bureau of Ordnance, ordnance material, \$33.10.
10	do.	do.	do.				Bureau of Steam-Engineering, \$3.17.
10	do.	do.	do.				Bureau of Navigation \$5.28.
10	do.	do.	do.				Bureau of Construction and Repair, \$80.80.
10	do.	do.	do.				Bureau of Equipment and Recruiting, \$51.18.
10	do.	do.	do.				Bureau of Construction and Repair.
12	United States Treasury	T. D. Wilson, chief Bureau of Construction and Repair.	On account of Cincinnati exhibit.		481.43	481.43	Bureau of Ordnance.
12	do.	T. J. Hobbs, disbursing clerk.	Castings furnished Bureau of Engraving and Printing.		16.56	16.56	
14	New York	A. Burtis, paymaster.	Sale U. S. S. <i>New York</i> , act March 3, 1883.	9.75		9.75	
29	do.	J. McMahon, paymaster.	One gig.	2.45		2.45	
31	First National Bank, Newport, R. I.	L. G. Hobbs, paymaster.	Provisions furnished officers' messes.		313.22	313.22	Bureau of Provisions and Clothing.
1889.							
Jan. 2	United States Treasury.	J. G. Walker, chief Bureau of Navigation.	Flags loaned Cincinnati expedition and damaged.		1,101.09	1,101.09	Bureau of Navigation.
3	do.	Brown Shipley & Co., fiscal agent.	Premium on remittance.	1,053.50		1,053.50	
22	do.	H. K. Gill, disbursing agent.	Old boilers (condemned).	614.65		614.65	Bureau of Steam-Engineering.
29	do.	R. Fraser, passed assistant paymaster.	Gain on exchange.	.70		.70	
29	do.	H. K. Smith, passed assistant paymaster.	do.	153.16		153.16	
29	do.	R. P. Lusk, paymaster.	do.	122.10		122.10	
29	do.	A. K. Michler, passed assistant paymaster.	do.	1.26		1.26	

# REPORT OF THE SECRETARY OF THE NAVY.

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Feb 6	Philadelphia.....	G. Cochran, pay inspector.....	Rent of wharf.....	200.00	.....	200.00	Bureau of Yards and Docks.
8	United States Treasury.....	H. A. Gill, disbursing agent.....	Log-book furnished <i>Greenough</i> .....	3.48	3.48	3.48	Bureau of Navigation.
	do	M. Seward, chief Bureau of Ordnance.....	2-inch box-tissue furnished State of New York.....	90.97	90.97	90.97	Bureau of Ordnance.
11	Philadelphia.....	H. C. Machette, passed assistant paymaster.....	Condemned horse and mule.....	68.55	.....	68.55	Bureau of Yards and Docks.
11	United States Treasury.....	J. R. Stedman, passed assistant paymaster.....	Gain on exchange.....	230.06	.....	230.06	Do.
16	do	J. H. Redfield, paymaster.....	do	186.55	.....	186.55	Bureau of Ordnance.
15	Baltimore.....	T. F. Caswell, pay inspector.....	Reimbursement for fare home.....	50.91	.....	50.91	Do.
20	United States Treasury.....	M. Seward, chief Bureau of Ordnance.....	Expended in trial of a Driggs-Schroeder gun.....	62.27	62.27	62.27	Bureau of Ordnance.
12	New York.....	A. Burlin, paymaster.....	Rents, etc., Wallabout.....	.....	.....	.....	Bureau of Equipment and Recruiting.
14	United States Treasury.....	G. A. Bartlett, disbursing clerk.....	Coal furnished steamer <i>Blake</i> .....	\$1,519.75	\$274.27	\$1,519.75	Bureau of Ordnance.
Mar. 1	New York.....	C. A. McDaniel, paymaster.....	Ordnance material, set March 3, 1875.....	.....	1.29	1.29	Bureau of Construction and Repair.
1	do	do	Condemned stores.....	19.00	.....	19.00	Bureau of Equipment and Recruiting.
1	do	do	do	56.14	.....	56.14	Bureau of Construction and Repair.
1	do	do	do	.....	.....	.....	Bureau of Construction and Repair.
1	do	do	do	.....	.....	.....	Bureau of Navigation, \$5.43.
1	do	do	do	.....	.....	.....	Bureau of Steam-Engineering, \$1.29.
1	do	do	do	.....	.....	.....	Bureau of Military Stores, \$0.35.
13	Norfolk National Bank, Norfolk, Va.....	C. W. Slamm, paymaster.....	Condemned horse.....	58.50	.....	58.50	Bureau of Medicine and Surgery.
22	United States Treasury.....	H. B. Lowry, quartermaster, U. S. Marine Corps.....	Condemned clothing.....	42.45	.....	42.45	.....
23	do	do	do	10.85	.....	10.85	.....
28	do	do	do	1.90	.....	1.90	.....
29	The First National Bank, Newport, R. I.....	L. G. Hobbs, paymaster.....	Provisions furnished officers messes.....	560.02	560.02	560.02	Bureau of Provisions and Clothing.
20	New York.....	J. E. Cann, passed assistant paymaster.....	Articles furnished steam-yacht <i>Sagehen</i> .....	240.41	240.41	240.41	Bureau of Equipment and Recruiting.
18	United States Treasury.....	G. A. Bartlett, disbursing clerk.....	46 pounds bar iron and 544 tons coal furnished <i>Blake</i> .....	391.70	391.70	391.70	Bureau of Equipment and Recruiting.
18	do	do	do	.....	.....	.....	Bureau of Steam-Engineering, \$1.38.
20	do	do	60 tons coal and salt-water soap.....	440.88	440.88	440.88	Bureau of Equipment and Recruiting, \$42.21.
20	do	do	do	.....	.....	.....	Bureau of Provisions and Clothing, \$8.67.
May 6	do	H. A. Gill, disbursing agent.....	Coal furnished <i>Fish Hawk</i> .....	354.81	354.81	354.81	Bureau of Equipment and Recruiting.
7	New York.....	O. A. McDaniel, paymaster.....	Condemned provisions.....	29.06	.....	29.06	Bureau of Provisions and Clothing.
8	do	L. G. Boggs, paymaster.....	Clothing, Navy.....	550.00	550.00	550.00	Do.
2	San Francisco.....	Wright, Browne & Co.....	Towage of schooner <i>Jane Grey</i> .....	40.00	40.00	40.00	Do.
3	do	G. H. Griffing, paymaster.....	Clothing, Navy.....	232.95	232.95	232.95	Do.

*Statement of deposits on account of sales of Government property, Navy Department, from November 1, 1888, to November 1, 1889—Continued.*

Date of deposit.	Place of deposit.	By whom deposited.	Nature of property sold.	Amount covered by miscellaneous receipts.	Amount credited to the appropriation.	Total amount deposited.	Remarks.
1889.							
May 15	Boston.....	C. W. Abbot, pay director.....	Repairs to steamer <i>Pouyer</i>		\$58.26	\$58.26	Bureau of Construction and Repair.
15	New York.....	A. Bartis, paymaster.....	Rents, etc. Wallabout.....	\$60.00		60.00	Do.
20	do.....	E. Stewart, pay inspector.....	Refunded by Japanese Government on account of injuries to U. S. S. <i>Jenetta</i> .		221.23	221.23	
20	do.....	J. E. Cann, passed assistant paymaster.....	Condemned stores.....	144.35		144.35	Bureau of Yards and Docks, \$70.68.
20	do.....	do.....	do.....				Bureau of Steam-Engineering, \$39.39.
20	do.....	do.....	do.....				Bureau of Construction and Repair, \$9.30.
20	do.....	do.....	do.....				Bureau of Equipment and Recruiting, \$24.98.
20	do.....	do.....	do.....		10.00	10.00	Bureau of Ordnance.
29	United States Treasury.....	M. Sicard, chief Bureau Ordnance.	Expense of taking off extra metal of 6-inch gun-hoop for Midvale Steel Company.				
21	do.....	G. A. Bartlett, disbursing clerk.	Coal furnished <i>Blake</i> .....				
31	San Francisco.....	G. H. Griffing, paymaster.....	Clothing Navy.....		479.02	479.02	Bureau of Equipment and Recruiting.
June 1	United States Treasury.....	J. S. Phillips, assistant paymaster.	Gain on exchange.....	172.69		172.69	Bureau of Provisions and Clothing.
1	do.....	J. E. Telfree, paymaster.....	do.....	2,895.15		2,895.15	
1	do.....	H. R. Smith, past assistant paymaster.	do.....	203.50		203.50	
1	do.....	M. C. McDonald, passed assistant paymaster.	do.....	191.89		191.89	
3	Philadelphia.....	H. M. Denniston, pay director.	Rent of wharf.....	200.00		200.00	Bureau of Yards and Docks.
8	New York.....	J. P. Loomis, paymaster.....	Clothing shipped to Naval Academy.		508.40	508.40	Bureau of Provisions and Clothing.
10	United States Treasury.....	H. B. Lowry, quartermaster, U. S. Marine Corps.	Condemned marine clothing.	229.02		229.02	
11	do.....	J. Corvino, passed assistant paymaster.	Condemned flour.....	46.55		46.55	
12	do.....	B. P. Little, paymaster.....	Gain on exchange.....	10.12		10.12	
12	do.....	Brown, Shipley & Co., fiscal agent.	Gain on exchange and interest on daily balance.	2,863.95		2,863.95	
14	do.....	H. B. Lowry, quartermaster, U. S. Marine Corps.	Condemned marine clothing.	49.37		49.37	

14	The Norfolk National Bank, Norfolk, Va.	C. W. Slamm, paymaster.	Repairing six cane-seat chairs.	18.00	18.00	Bureau of Yards and Docks.
20	The First National Bank, Newport, R. I.	L. G. Hobbs, paymaster.	Provisions furnished officers' messes.	659.63	659.63	Bureau of Provisions and Clothing.
20	San Francisco	G. H. Griffing, paymaster.	Clothing, Navy.	594.50	594.50	Bureau of Steam Engineering.
20	New York	G. H. Reed, paymaster.	Material furnished Cramp & Sons.	2.42	2.42	
23	United States Treasury.	J. A. Mudd, assistant paymaster.	Gain on exchange.	35.60	35.60	
22	do	A. D. Buche, paymaster.	Condemned marine clothing.	18.46	18.46	
25	do	A. J. Clark, pay inspector.	Gain on exchange.	34.76	34.76	
27	do	J. R. Stanton, paymaster.	Condemned marine clothing.	117.10	117.10	
June 29	United States Treasury	A. W. Bacon, paymaster.	Two condemned horses.	\$103.84	\$103.84	Bureau of Yards and Docks.
July 13	Baltimore.	H. T. B. Harris, paymaster.	Clothing furnished cadet store-keeper.	\$600.28	\$600.28	Bureau of Provisions and Clothing.
11	New York	E. Stewart, pay inspector.	Default in delivering coffee on contract price, difference between contract price and price at which purchased.	1,260.00	1,260.00	Do.
18	United States Treasury	H. A. Gill, disbursing agent.	Coal furnished Fish Commission.	475.42	475.42	Bureau of Equipment and Recruiting.
18	do	A. W. Bacon, paymaster.	Condemned stores.	92.26	92.26	Bureau of Steam-Engineering.
19	do	E. N. Whitehouse, paymaster.	do	3.12	3.12	Bureau of Provisions and Clothing.
19	do	S. R. Colhoun, paymaster.	Gain on exchange.	52.06	52.06	
24	do	J. McMahon, paymaster.	do	210.81	210.81	
24	do	Brown, Shipley & Co., fiscal agents.	Gain on exchange and interest on daily balance.	420.88	420.88	
26	do	M. Sicard, chief Bureau of Ordnance.	Preliminary test of 8 inch carriage, paid by Pneumatic Gun Carriage and Power Company.	643.76	643.76	Bureau of Ordnance.
Aug. 23	The First National Bank, Portsmouth, N. H.	G. A. Lyon, pay inspector.	One ox.	62.75	62.75	Bureau of Yards and Docks.
17	United States Treasury	G. A. Bartlett, disbursing clerk.	Articles furnished Blake.	88.86	88.86	Bureau of Equipment and Recruiting.
15	New York	J. N. Speel, passed assistant paymaster.	Gain on exchange.	9.25	9.25	
6	do	G. H. Reed, paymaster.	Rents, etc., Wallabout.	1,570.50	1,570.50	
16	United States Treasury	R. P. Lisle, paymaster.	Gain on exchange.	312.07	312.07	
29	do	E. Furey, paymaster.	do	108.57	108.57	
31	do	E. Bellows, paymaster.	do	12.18	12.18	
Sept. 4	do	T. J. Hobbs, disbursing clerk.	Castings furnished Bureau of Engraving and Printing.	32.89	32.89	Bureau of Ordnance.
17	do	H. B. Lowry, quartermaster, U. S. Marine Corps.	Fuel furnished officers.	950.00	950.00	
18	do	do	do	1,500.68	1,500.68	Bureau of Equipment and Recruiting.
27	do	H. A. Gill, disbursing agent.	Coal furnished Fish Commission.	446.76	446.76	Bureau of Provisions and Clothing.
Oct. 4	The First National Bank, Newport, R. I.	L. G. Boggs, paymaster.	Provisions furnished officers.	494.00	494.00	

*Statement of deposits on account of sales of Government property, Navy Department, from November 1, 1888, to November 1, 1889—Continued.*

Date of deposit.	Place of deposit.	By whom deposited.	Nature of property sold.	Amount covered to miscellaneous receipts.	Amount credited to the appropriation.	Total amount deposited.	Remarks.
1889							
Oct. 22	United States Treasury	W. W. Galt, passed assistant paymaster.	Old smoke-pipe.	\$6.30		\$6.30	Bureau of Steam-Engineering.
22	do	Seligman Bros., fiscal agents.	Interest on daily credit balances.	263.45		263.45	
22	do	R. Frazer, passed assistant paymaster.	Gain on exchange	2.41		2.41	
25	New Orleans	H. T. Skelding, paymaster.	Condemned chain-cable.	361.11		361.11	Bureau of Equipment and Recruiting.
	Grand total.			50,537.12	\$27,835.06	87,372.18	

#### No. 4.—DISASTER AT APIA, SAMOA.

REPORT OF REAR-ADMIRAL L. A. KIMBERLY.

APIA, SAMOA, March 19, 1889.

SIR: It becomes my painful duty to report to the Department the disastrous injury and loss sustained by the vessels under my command in the harbor of Apia during the hurricane which swept these waters March 15 and 16. When the gale commenced there were in the harbor the following men-of-war: U. S. ships *Trenton*, *Vandalia*, and *Nipsic*; H. B. M. ship *Calliope*, and H. I. G. M. ships *Adler*, *Olga*, and *Eber*. There were also a few merchant vessels and small craft. The *Nipsic* had the inner berth, and the *Trenton* (last to arrive) had the outer berth.

Indications of bad weather appeared during the forenoon of Friday, March 15, and at 1 o'clock on that day I commenced preparations to meet a gale by sending down the lower yards and housing topmasts. Fires were lighted and steam raised. By 3 o'clock the gale had developed. It blew hard during the evening, and about 8 p. m. we parted our port bower cable. During the night it blew with great violence, but with aid of steam the vessels kept in good shape till morning. At daylight we had hoped for a moderation of the wind, but were disappointed. The gale set in with renewed fury, and early in the forenoon it was evident that some of the inner ships were ashore and those nearer to us were riding uneasily. The flag-ship lost her wheel about this time. It carried away with a crash and seriously injured some of the helmsmen. Relieving tackles and spare tiller were applied promptly, but it was discovered that the rudder was broken, and soon it was entirely useless.

The wind by this time was blowing with hurricane force and the seas were very heavy. The ship had begun to make water during the early morning. The hand pumps were manned and all bilge pumps in the engine-room put on. The water gained and threatened to put out the fires; the greater part of it seeming to come in through the hawse pipes which are situated on the berth deck. Every effort was made to stop the entrance of water at this point, by jamming in bedding, and by putting waulding on the chains, and veering into the hawse pipes. It could be checked in this way but not stopped; for the violence of the seas was so great that it would force back everything that opposed it. All hands were set to bailing, and the handy billy rigged, but by 9.30 a. m. the fires had been put out and the men driven up from the fire-room. Work at the hand pumps and with the buckets continued from this time throughout the gale, with the hope of being able to relight the fires and keep the ship afloat.

A little before noon the *Calliope* was seen to be very uneasy at her moorings, and soon she steamed towards us, having parted or slipped her cables, and making an effort to go out the harbor she came near colliding with us and steamed out in the face of the hurricane. In the afternoon, the wind having hauled a little, the flag-ship was more unsteady at her moorings and parted two chains, one soon after the other. We then drifted over towards the eastern reef, escaping the wreck of a



merchant bark by the mere chance of her dragging as we approached her. We drifted until our stern was almost against the reef. Destruction seemed imminent, as the vessel was within a few feet of the reef for a long while and pitching heavily. We drifted in this position along the reef for a considerable distance until we came to where it turned more toward the eastward. Here we found smoother water and our remaining anchor seemed to hold quite well for a time. This position, however, put us directly in the hawse of H. I. G. M. S. *Olga*, which vessel had one of the smoothest berths in the harbor at this time. She was riding well and had control of her engines. Efforts were at once made to heave over the 8-inch rifle-gun from the fore-castle, to assist in holding, but it could not be done in time. We slowly drifted upon her, and she avoided us twice by skillful use of helm and engines, but soon after cut into our quarters, first one side, then the other, carrying away boat's rigging and quarter galleries, but not essentially injuring the hull.

During all this time the officers of the flag-ship made every effort to manage her by the storm sails and putting men in the rigging. We drifted by the port side of the *Olga*, and across to the western reef, dragging the anchor and tailing now on the western reef as we had before done on the eastern. Some of the wrecked vessels were now in plain sight; *Nipsic* well inshore on good bottom, stern to the seas; *Vandalia* sunk against the reef, masts standing and tops and rigging filled with men; spray and surf flying to their mastheads. *Eber* nowhere to be seen. *Adler* on her side, high on the reef. The *Olga* had turned for the shore and going ahead under steam and sail was beached on good bottom and in a good position, stern to the seas.

All this time the gale was blowing with unabated fury. About 6 o'clock we were expecting to strike the reef momentarily. It was directly under our stern; but, as on the eastern side, an under tow or current seemed to carry us along the reef and keep us just clear of striking. Thus we came on to where the *Vandalia* was lying, and it was evident that our stern would soon strike against her port side. As we approached her rockets were fired, carrying lines, with the hope of rescuing the people on her masts. This proved very successful, and the men from the main and mizzen were rescued first. Soon after we struck the *Vandalia* with violence, and her main and mizzen masts went by the board. We then swung gradually and settled into a position alongside of her, just touching the bottom, and our stern grazing a small wreck and the reef. The men were rescued from the foremast of the *Vandalia*, and thence on during the night we continued to beat upon the bottom and against the *Vandalia* with great force.

The wind during this (Saturday) night blew with hurricane force, squall following squall with hardly any appreciable interval. The seas, however, were not so high as they were further out, and we got through the night without additional serious misfortune.

Just before daylight the flag-ship was visited by two boats manned entirely by natives, who carried lines to the shore. This was dangerous work, owing to the darkness, to the sea and current, to the reefs and wreckage, and to the difficulty of approaching the *Trenton* on account of the *Vandalia's* wreck.

The men were kept at the pumps and buckets without cessation, with a view to hauling off the ship, if possible, and keeping her afloat when the gale abated. In the morning the wind moderated. It was then ascertained that the propeller was missing. The ship had settled hard on the bottom, and the water could not be reduced; it was up to the engine-room platform and rising. Under these circumstances, and in

the absence of any docking facilities or marine railway appliances and powerful pumps, the abandonment of the ship became necessary. Stores were gotten up as rapidly as possible, and the people got their effects ashore. Immediately thereafter the crew was set to work getting out and saving from her everything possible. On Monday the water was up to her gun deck, and she had settled a little on her port side. On Tuesday she had settled more to port and was still lower in the water.

The *Vandalia* is completely submerged, only her foremast and head-booms showing above the water. The *Nipsic* is lying in about 7 feet of water at low tide (rise and fall about 4 feet). She would probably have to be hauled astern some 500 feet to float her at high tide. She has lost her smoke-pipe, also her rudder, and her propeller is badly damaged. Her crew remain on board, and she keeps her bilges free of water by the steam-pump. I have ordered a board to investigate at once the possibility of saving the *Nipsic*, and to further investigate and report upon all circumstances connected with the loss and damage of the vessels by the gale. The report of this board will be forwarded by the first opportunity after its receipt by me. The crews of the *Vandalia* and *Trenton* are in barrack on shore. The *Calliope* steamed into the harbor this morning, showing signs of having experienced heavy weather. She goes to Sydney as soon as possible for repairs, and through the kindness of Captain Kane her diving outfit has been turned over to us, and it will be of the greatest assistance in saving stores. I commend his services to the Department, and trust that they will be regarded as worthy of recognition.

Lieutenant Wilson goes to Auckland to report the catastrophe to the Department by cable, and to charter a steamer to take to San Francisco the *Vandalia's* crew and others of the squadron who are sick and disabled. By the *Calliope* I send a duplicate dispatch to Sydney to be forwarded by the United States consul to the Department.

I have received the most valuable assistance from Malietoa Mataafa, who has sent a large number of his men to help in getting stores and public property from the ships.

The *Calliope* when she went out the harbor carried 90 pounds of steam, making seventy-four revolutions, and then was just able to make headway against the gale; and when outside, during the period of four hours she made no headway, engines running at full speed.

I regret to report the following loss of life:

On the *Vandalia*, four officers and thirty-nine men, viz:

Capt. C. M. Schoonmaker.	Frank Lissman, sergeant.
Paymaster Frank H. Arms.	E. M. Hamner, seaman.
First Lieut. F. E. Sutton, marine corps.	George Gorman, carpenter.
Pay Clerk John Roche.	M. Craigin, captain after-guard.
George Murrage, bayman.	William Brown, first quartermaster.
B. F. Davis, engineer's yeoman.	T. G. Downey, paymaster's yeoman.
M. H. Joseph, engineer's yeoman.	Michael Cashen, corporal.
N. B. Green, bayman.	Nicholas Kinsella, corporal.
H. P. Stalman, bayman.	H. C. Gehring, private marine.
C. H. Hawkins, steerage steward.	Adolph Goldner, private marine.
C. E. G. Stanford, landsman.	Frank Jones, private marine.
W. Brisbane, cabin steward.	George Jordan, private marine.
Joseph Griffin, first-class fireman.	John Willford, private marine.
M. Erickson, ordinary seaman.	Henry Wixted, private marine.
Thomas Kelly, second-class fireman.	Aylmer Montgomerie, private marine.
W. Howat, coal heaver.	John Sims, private marine.
C. P. Kratzer, ordinary seaman.	G. H. Wells, private marine.
Thomas Riley, landsman.	Charles Kraus, private marine.
John Kelly, ordinary seaman.	Ah Kean, cabin cook.
Henry Baker, landsman.	Ah Pack, seamen's cook.
John Hanchett, sergeant.	Pen Dang, landsman.
	Yee Hor, ward-room cook.

On the *Nipsic*, seven men, viz:

Joshua Heap, apprentice.  
 George W. Callan, apprentice.  
 Henry Pontseel, coxswain.  
 William Watson, first-class fireman.

David Patrick Kelleher, coal heaver.  
 John Gill, seaman.  
 Thomas Johnson, cabin steward.

On the *Trenton*, J. Hewlett (landsman) was struck on the head by the breaking in of a port, and died soon after.

During the entire time Captain Farquhar showed great care and good judgment in handling the ship through this terrific gale and never left the bridge. He was ably seconded by his executive and navigating officers, who did all in their power to save the ship. In fact, so far as I could observe, all the officers behaved extremely well under the trying circumstances and performed their duties cheerfully, effectively, and as well as could be desired.

This disaster I classify among the incidents and accidents inseparable from the prosecution of duty. Its magnitude, however, gives it a distinguishing feature which, fortunately, the service is rarely compelled to witness.

Captain Farquhar has demanded a court of inquiry. No disinterested officers are available here. I therefore respectfully refer the entire matter to the Department, and if further investigation is deemed necessary I should be pleased to have a court of inquiry ordered.

Very respectfully, your obedient servant,

L. A. KIMBERLY,  
*Rear-Admiral, U. S. Navy,*  
*Commanding U. S. Naval Force on Pacific Station.*

THE SECRETARY OF THE NAVY.

REPORT OF CAPT. N. H. FARQUHAR, COMMANDING U. S. S. TRENTON.

APIA SAMOA, March 19, 1889.

SIR: I have the honor to inform you that the U. S. flag ship *Trenton*, under my command, was driven ashore in a hurricane on Saturday, March 16, about 8 p. m., alongside the wreck of the U. S. S. *Vandalia* in this harbor.

The ship has since filled with water and, in my opinion, has broken in two places—abreast the mizzen mast and near the smoke-stack.

It is possible the ship might be floated to dock with the assistance of powerful pumps used by wrecking companies, but, as there are no facilities of this kind, she will be a total loss.

On Thursday, March 14, the wind came out approximately from the southward, with much rain, the barometer slowly falling, being 29.70 at noon, 29.60 at midnight; the force of the wind from 2 to 4. During the mid-watch, March 15, got up steam, wind remaining in the same direction and varying from 0 to 4, the barometer falling from 29.60 to 29.56. At 4 a. m. the wind, and until 8 a. m., was from 2 to 6 in force, the barometer at 8 a. m. being 29.42.

By noon, though the barometer fell to 29.30, the wind had not increased, or practically changed in direction.

During this watch prepared to send down lower yards and house topmasts. From meridian to 4 p. m. sent down lower yards, housed top-

mast, and made preparations for bad weather. At 1 p. m. the wind was east, force 1 to 2, barometer 29.24; at 2 p. m. wind variable, force 1 to 2, barometer 29.20; at 3 p. m. wind northeast, force 2 to 4, barometer 29.20; at 4 p. m. wind north, force 4 to 7, barometer 29.29.

This seemed to indicate that the gale had broken and that the wind would haul to the west. Instead, however, it backed to the northeast barometer, rising at 8 p. m., being 29.36, wind northeast, force 4 to 8.

Up to this time the ship was moored with 52 fathoms on port bower, 45 fathoms on starboard bower, with starboard sheet under foot. At 7.57 parted port bower chain, let go port sheet, steamed ahead, veering to 60 fathoms on it and starboard bower.

The barometer during this watch, 8 p. m. to midnight, was steady about 29.40, wind northeast by north to north-northeast, force 7 to 8. Midwatch of March 16, barometer 29.36 to 29.38, wind north-northeast, force 7 to 8, steaming ahead slowly to relieve strain upon anchors. At 6 a. m. barometer fell to 29.23, wind north by east, force 6 to 9, tremendous sea. About 7 a. m. wheel ropes carried away, rudder broken in two pieces, so as to be useless. About 9 a. m. wind came out from north, force 8 to 10, barometer rising to 29.30 at 11 a. m. At 9.30 fires were extinguished by water in fire-room, which came from hawse pipes, notwithstanding every precaution in the way of jackasses, hammocks, etc., having been used to keep the water out, but being on the berth deck, low down, and a full bowed ship, it was impossible to keep the water out. The hand as well as steam pumps were going, with men bailing besides, and the hatches battened down.

I attribute the loss of the ship primarily to the location of the hawse-pipes. I have several times reported officially against their location to the Navy Department.

Up to noon the ship had dragged very little, if any; at noon, barometer 29.29, wind blowing hurricane from the north.

At 1 p. m. the barometer fell to 29.19, the lowest reading, the hurricane continuing with the same force till about midnight, the barometer rising slowly, reaching 29.52 at that hour; wind north-northwest.

From 4 to 8 p. m., dragging slowly at times, set storm, mizzen, and mizzen-stay sail, with sheets amidships to prevent any sheering of the ship. About 3 p. m. parted port sheet chain, and shortly after starboard bower veered to 90 fathoms on remaining anchor.

Shortly after 8 p. m. dropped alongside the *Vandalia*, took off her crew from the tops and rigging, and made fast to her. Pounding terribly all night, but the wreck of the *Vandalia* kept us off the reef. Notwithstanding every effort could not keep the water down in the holds. About midnight the wind had somewhat abated. At daylight, the morning of the 17th, a line was sent to us from the shore.

As much of the provisions as could be handled were gotten on the spar deck. In the afternoon of the 17th, the water still gaining, it was deemed advisable to land the officers and crew.

Permit me to express my most heart-felt thanks to you for your most valuable counsel and for keeping us in good cheer, particularly when in our greatest danger, by your good example.

During these trying days the officers sustained the reputation that our Navy is proud of. The crew generally worked well.

Lient. R. M. G. Brown, the navigator, was by my side the whole time, and to his excellent judgment, one time at least, the ship was cleared of a reef. Had we struck it I fear few of the four hundred and fifty people on board of the *Trenton* would be alive to-day.

Several officers and many men were injured, but only one man killed, J. Hewlett, landsman, whose skull was broken by the sea. His remains were interred there.

I respectfully demand a court of inquiry.

Very respectfully,

N. H. FARQUHAR,

*Captain, U. S. Navy, Commanding U. S. F. S. Trenton.*

Rear-Admiral L. A. KIMBERLY,

*U. S. Navy, Commanding U. S. Naval Forces on Pacific Station.*

CAPTAIN FARQUHAR TO THE SECRETARY OF THE NAVY, COMMENDATORY OF COMMANDER H. W. LYON.

U. S. S. TRENTON (2D RATE),

*Apia, Samoa, April 22, 1889.*

SIR: It may happen that I will not have an opportunity, before a court of inquiry, to bring to the notice of the Department the good conduct of Lieut. Commander H. W. Lyon, U. S. Navy.

I therefore take this means of testifying to his excellent service during the hurricane of March 16 and 17, 1889, and since then, in saving valuable property from the wreck.

During the gale he intelligently carried out my orders; personally supervising the many plans to keep out water, getting lines to the *Vandalia* to prevent the total destruction of the *Trenton*, and many other duties besides. Since leaving the ship he has, under most unfavorable circumstances, succeeded in getting all the battery on shore without accident or loss.

Very respectfully, your obedient servant,

N. H. FARQUHAR,

*Captain, Commanding.*

The honorable SECRETARY OF THE NAVY,

*Navy Department, Washington, D. C.*

U. S. FLAG-SHIP TRENTON (2D RATE),

*Apia, April 22, 1889.*

Approved and forwarded.

L. A. KIMBERLY,

*Rear-Admiral, Commanding U. S. Naval Force, Pacific Station.*

CAPTAIN FARQUHAR TO THE SECRETARY OF THE NAVY, COMMENDING CADET R. H. JACKSON.

WASHINGTON, D. C., October 26, 1889.

SIR: It has recently come to my knowledge that when the crew of the U. S. S. *Trenton*, during the recent hurricane in Samoa, were ordered into the mizzen rigging to act as a sail to bring the ship head to wind, Naval Cadet R. H. Jackson jumped into the rigging, leading the way, thus setting a good example to the men. I beg to bring this gallant conduct on his part to the notice of the Navy Department.

Very respectfully, your obedient servant,

N. H. FARQUHAR,

*Captain, U. S. Navy, Lately in Command of the U. S. S. Trenton.*

Hon. B. F. TRACY,

*Secretary of the Navy.*

*THE SECRETARY OF THE NAVY TO R. H. JACKSON, LATE NAVAL CADET.*

NAVY DEPARTMENT,  
Washington, October 28, 1889.

SIR: I take pleasure in furnishing you with a copy of a communication addressed to the Department on the 26th instant by Capt. N. H. Farquhar, late commanding officer of the U. S. S. *Trenton*, in which he brings to its notice an act of gallantry on your part, on the occasion of the wreck of that vessel, which recently came to his knowledge.

He reports that when, during the hurricane at Samoa, the crew of the *Trenton* were ordered into the rigging to act as a sail to bring the ship's head to the wind you led the way, and set a good example to the men.

The foresight and promptness exhibited by you on the occasion in question belongs to that class of gallant acts and deeds under trying emergencies which reflect honor on the naval profession and lead to good results.

The Department is pleased to place on its files Captain Farquhar's tribute to your gallantry.

Very respectfully,

B. F. TRACY,  
*Secretary of the Navy.*

MR. R. H. JACKSON,  
*Late Cadet, U. S. Navy,  
University of Virginia, Charlottesville, Va.*

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*GALLANT CONDUCT OF FUGI HACHITARO, CABIN STEWARD OF THE  
U. S. S. TRENTON.*

NAVAL EXAMINING BOARD, NAVY DEPARTMENT,  
Washington, July 3, 1889.

SIR: The Naval Examining Board, to whom was referred the duplicate report, dated May 11, 1889, of Lieut. John C. Wilson, U. S. Navy, of the late U. S. S. *Vandalia*, and a supplementary report dated July 1, 1889, and a sketch from the same officer, together with a report of investigation by Lieut. R. M. G. Brown, U. S. Navy, dated May 11, 1889, a letter from the Japanese consul at San Francisco, Cal., and one from Capt. N. H. Farquhar, U. S. Navy, commanding the late U. S. S. *Trenton*, dated June 24, 1889, have carefully considered the facts set forth in these reports, and are of opinion that the act of Fugi Hachitaro, cabin steward of the U. S. S. *Trenton*, in going to the assistance of Lieutenant Wilson, under the circumstances described, was one of extreme and heroic daring.

We therefore respectfully recommend that he be awarded a life-saving medal of the first class, as provided for in section 7, page 127, vol. 18, *Statutes at Large*, and that his conduct be commended in general orders.

The letters and reports in the case are appended to this report.

A. W. WEAVER,  
*Commodore, U. S. Navy, President.*  
R. R. WALLACE,  
*Captain, U. S. Navy, Member.*  
SILAS W. TERRY,  
*Commander, U. S. Navy, Member.*

HON. BENJAMIN F. TRACY,  
*Secretary of the Navy, Navy Department.*

CHARTER STEAMER ROCKTON,  
At Sea, May 11, 1889.

SIR: \* \* \* Fugi Hachitaro (cabin steward), of the U. S. flag-ship *Trenton*, is the man who came down over the stern of the *Trenton* and helped me out of the water, putting a rope about me by which I was hauled on board the *Trenton*.

This he did at the imminent risk of his life, as the sea was running high, the ships rolling violently, and the mainmast to which I was clinging in danger of being carried away at any moment, and was actually carried away very soon after I was rescued. \* \* \*

I consider the act of Fugi Hachitaro particularly worthy of commendation, as he voluntarily placed his life in great jeopardy to assist me, when I most likely would have drowned without such assistance.

Very respectfully,

J. C. WILSON,  
Lieutenant, U. S. Navy.

Rear-Admiral L. A. KIMBERLY, U. S. Navy,  
Commanding U. S. Naval Forces, Pacific Station.

MAY 11, 1889.

Forwarded.

J. W. CARLIN,  
Lieutenant, U. S. Navy, Commanding.

Forwarded.

N. H. FARQUHAR,  
Captain, Commanding U. S. S. *Trenton*.

WASHINGTON, July 1, 1889.

SIR: I beg to submit the following supplementary statement concerning the conduct of Fugi Hachitaro therein referred to.

About 9 o'clock on the night of March 16, during the hurricane at Apia, Samoan Islands, in which the U. S. S. *Vandalia* was wrecked, in attempting to get from the *Vandalia* to the *Trenton* I fell from the rigging of the *Vandalia* into the water, but succeeded in catching hold of the Jacob's ladder, running up and down the after part of the mainmast, to which I clung, but found myself too weak to get any higher than with my head just above the surface of the water. Had I been left there I would probably have drowned, as the water was continually breaking over me. The ship at this time was entirely submerged and the waves breaking over her from side to side.

The main-yard was secured across and on the rail, being swept from time to time by the heavy seas. The hurricane was at its height and the ship was rolling violently. The *Trenton* had drifted down until her stern was pressing hard against the main-yard, which might be carried away at any moment, and the mast must soon follow.

My position was very perilous, and it seemed as if no aid could reach me. Fugi Hachitaro (cabin steward), of the *Trenton*, had observed me falling and afterwards clinging to the ladder. He climbed over the stern of the *Trenton* and succeeded in getting on the main-yard of the *Vandalia*, along which he made his way until he got within reach of me. He then assisted me onto and along the yard till we reached the rigging, when a line was sent down, which he passed around me, and

by which I was hauled on board the *Trenton*. He remained until the line could be sent down again for him.

The fact that the seas were breaking over the yard, that the ship was rolling, and that the yard and mast were in danger of being carried away at any moment (and were actually carried away a few minutes after I left it), made this act of Hachitaro's one of great bravery, by doing which he voluntarily risked his own life and was undoubtedly the means of saving mine.

\* \* \* \* \*

I have the honor to be, sir,

J. C. WILSON,  
*Lieutenant, U. S. Navy.*

Hon. BENJAMIN F. TRACY,  
*Secretary of the Navy, Navy Department.*

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NAVY DEPARTMENT,  
*Washington, August 5, 1889.*

SIR: I have the honor to inclose herewith a copy of the report of a board of three officers of high rank in the Navy, who were directed by this Department to consider the facts reported in the case of Fugi Hachitaro, cabin steward, late of the U. S. S. *Trenton*, who went to the assistance of Lieut. John C. Wilson, U. S. Navy, who was clinging to the wreck of the late U. S. S. *Vandalia* when that vessel was lost in a hurricane at Apia, Samoa, March 16, 1889.

You will observe that this board has found that the act of Fugi Hachitaro referred to was one of extreme and heroic daring, and that it recommends that he be awarded a life-saving medal of the first class as provided for in section 7, page 127, volume 18, Statutes at Large, and that his conduct be commended in general orders.

I inclose herewith for the files of the Treasury Department the evidence in this case, together with the recommendation of the board, which has my approval.

Very respectfully,

B. F. TRACY,  
*Secretary of the Navy.*

THE SECRETARY OF THE TREASURY.

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TREASURY DEPARTMENT,  
*November 18, 1889.*

SIR: I have the honor to transmit to you, by messenger, a gold life-saving medal, which has been awarded Fugi Hachitaro, under authority of section 7 of the act of June 20, 1874, and section 9 of the act of May 4, 1882, for signal heroism in rescuing an officer of the U. S. S. *Vandalia* from drowning March 16, 1889.

I will thank you to cause the medal to be forwarded to Lieut. John C. Wilson, U. S. Navy, to be delivered to Mr. Hachitaro, with the accompanying letter.

Respectfully, yours,

GEO. S. BATCHELLER,  
*Acting Secretary of the Treasury.*

THE SECRETARY OF THE NAVY.



## REPORT OF COMMANDER D. W. MULLAN, COMMANDING U. S. S. NIPSIC.

U. S. S. NIPSIC (THIRD RATE),  
*Apia, Samoa, March 21, 1889.*

SIR: I regret to report that I was compelled to beach this vessel in Apia Harbor on the morning of March 16, 1889, in order to save her from total destruction and to save the lives of those under my command. The necessity was occasioned by the severe hurricane raging on that day and the parting of all the chains. During this hurricane the vessel had three anchors down and veered to their full scopes as far as possible in order not to collide with either of the German men-of-war *Olga* or *Eber*, the former on the port beam and the latter astern and close aboard. During the height of the hurricane and at about 5 a. m. of March 16, the German war vessel *Olga* fouled this vessel, carrying away the whale-boat, dinghy, and port railing of poop deck, bending davits, etc. About 6 a. m. the *Olga* again fouled this vessel, this time cutting away the port hammock rail from the bridge to the gangway, and the upper and a portion of the lower section of the smoke-stack, the after ventilators, the port main yard arm, the steam launch, and second cutter.

Having lost the smoke-stack and there being no draft, I found it necessary to use pork in the furnaces.

During the morning watch three men were washed overboard and swam safely to the shore. The seas were breaking over the ship so rapidly that some of the gun ports were let down and the water baled through them overboard. At this time an effort was made to get the forecastle gun overboard as an additional anchor, when at 6.30 a. m. the starboard bower chain parted and the ship continued to drag towards the reef astern the ship. Finding it impossible to keep steam up and there being every probability of the ship going ashore on the reef, I decided to beach her in order to save life. At 6.50 a. m. the port chain was slipped and the ship was beached in front of the United States consulate. Prior to slipping, all the prisoners were released. As soon as the ship was beached all the sick were sent on shore. In attempting to lower the gig in order to run a line on shore she was capsized, and the following named men, I regret to report, were lost, viz: Henry Pontseel, seaman; John Gill, seaman; George W. Callan, apprentice; Joshua Heap, apprentice, and Thomas Johnson, cabin steward; D. P. Kelleher, C. H., and William Watson, oiler, jumped overboard and were also lost. Lines were run from the forecastle by means of which all hands abandoned ship on the aforesaid morning. During the abandonment the Samoans did excellent work. The casualties of the ship during the hurricane are as follows: Cut-water gone; both bower anchors gone; jibboom sprung; starboard fore topsail sheet bitt gone; mainmast broken at second band from spar deck; port hammock rail carried away from bridge to gangway; port main chains carried away; four shrouds of port main rigging carried away; port mizzen chains carried away; steam launch, second cutter, whale-boat, and dinghy all gone; sailing launch badly damaged; deck-seams opened on quarter-deck; rudder-post and rudder gone; main-yard gone; upper section of smoke-stack carried away and lower section badly damaged; both after-ventilators gone.

In the ordnance department many articles, such as priming wires, cartridge-boxes, belts, lock strings, etc., were either damaged by salt water or washed overboard.

In the navigation department such articles as deck lamps, log-lines, and leads were swept overboard. The three working chronometers and comparing watch have been rendered useless by being filled with salt water, the seas coming down the wood-room hatch. In examining the magazine 4 inches of water were found therein, but it is now comparatively dry. More or less water was found in the store-rooms of the paymaster, containing provisions and clothing.

In the engineer's department boilers Nos. 5 and 6 have spread about 3 inches, bending the tie-rods and lugs attached to after side. The forward cylinder of main engine appears to be raised about  $2\frac{1}{2}$  inches. The after bunker, starboard side, is carried away along the lower edge. The engines can not be jacked a full revolution, showing that they are considerably out of line. From an examination by a diver it is found that the three blades of the propeller are bent and a portion of the fourth gone; a portion of the false keel gone; also a portion of the stern post. The planking on the port side from abreast the smoke-stack to break of forecabin is slightly chafed. Several sheets of copper are off. There are some sails and hawsers now foul of the propeller. The rudder and rudder-post are gone and the shoe is carried away. The ship is at present making no water.

In conclusion I will say that everything was done that could have been done to save the vessel from a total wreck and the lives of those attached to the ship. Regretting this sad occurrence,

I am, sir, very respectfully, your obedient servant,

D. W. MULLAN,  
Commander, Commanding.

Rear-Admiral L. A. KIMBERLY, U. S. Navy,  
Commanding U. S. Naval Force on Pacific Station.

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REPORT OF LIEUT. JAS. W. CARLIN, EXECUTIVE OFFICER OF THE *VANDALIA*.

APIA, SAMOA, March 21, 1889.

SIR: On the 15th and 16th of March a violent gale swept over Apia, wrecking and beaching every craft in the harbor except H. B. M. S. *Calliope*, a powerful steamer, which saved herself by going to sea.

The gale was long foretold and the *Vandalia* was prepared for heavy weather, having sent down lower yards, housed topmasts, and got up steam in obedience to signals from the flag-ship. We were moored with our anchors northeast by east and southwest by west, 45 fathoms on each chain, starboard anchor well over to the eastern reef. The shifts of wind previous to the final blow put an elbow in the hawse. When the strength of the gale came upon us we were directly in the hawse of the *Calliope*, rendering it injudicious to veer.

All the vessels in the harbor were to leeward of us except the *Trenton*. About midnight of the 15th we began to drag and commenced to steam up to our anchors, and continued to steam with but few intermissions until we struck, the speed varying from 18 to 42 revolutions. The engines worked well, with the exception of a short time when the steam ran down to 25 pounds, caused by an accident to one of the boilers. We had on seven boilers of the eight, and they furnished all the steam the engines could use.

We had but one sheet-anchor, and the stock of that was broken in the last gale. This anchor was held in reserve as long as possible, in expectation of the wind coming out from the northward and westward, but was let go about 2 a. m. of the 16th as near the weather reef as possible.

At daylight we saw that the vessels in the inner harbor were in trouble. The *Eber* soon disappeared entirely, and the *Adler* struck the reef, the seas heaving her on top of it and capsizing her. The *Calliope* was our nearest neighbor, and from daylight until 9 a. m. we were in imminent danger of getting foul of each other, and also of striking the reef, being frequently within 50 feet of it and sometimes within 20 feet. The current was so strong that spanker, helm, and two anchors on weather bow were not sufficient to bring the ship's head to wind. The seas were of immense force, and the steering gear was carried away about 8 a. m. The ship was steered thereafter by the relieving tackles.

The *Calliope* put to sea about 9 a. m., and one obstacle was removed from our path. Feeling that we must go on the reef if we remained where we were, we made every exertion to get into the inner harbor, hoping to escape the extraordinary current we had heretofore encountered. In doing so, we passed between the *Olga* and the lee reef with but a few feet to spare on either hand.

We slipped the sheet-chain to avoid fouling the *Olga's* ground tackle, and veered on both bowers to clear the ship herself. After passing the *Olga* we made strenuous exertions to bring her head to the wind, but they were of no avail, and the stern took the inner point of the reef at 10.45 a. m. The engines were kept going until we were convinced that the ship was hard and fast. They were then stopped, safety valves opened, and the firemen called on deck. The ship's head swung slowly to starboard, she began to fill and settle, and the rail was soon awash, the seas sweeping over her at a height of 15 feet above the rail. We were within 200 yards of the shore, but the current was so strong and the seas so high that swimming was a reckless undertaking.

We found the *Nipsic* beached and abandoned just inside of us. A line was got on board her, but more were drowned than saved. It was impossible to get a line to the shore. There is no apparatus for throwing a line and our buoys floated to seaward. E. M. Hammar, seaman, attempted to carry a line, but was swept back against the ship and killed. Many men attempted to swim, but so many were drowned that the remainder were deterred.

The commanding officer was washed overboard from the poop about half an hour after striking, his strength had been exhausted by constant work for so long a time and he was unable to sustain the shock of the heavy seas. He was surrounded by officers and men and had been rescued several times, when a sea of unusual violence swept him, and all in his immediate vicinity, overboard. The crew then deserted the poop and forecastle and took refuge in the tops and rigging, where they remained until about 8 p. m., eight hours. The *Olga* was driven on shore about 5 p. m.

About dark the *Trenton* dragged down on us, and we expected her to carry away our masts and throw us into the sea, but she came down so gently and was so expert in throwing us lines that nearly all our men escaped from their perilous position in the rigging to the comparative safety of the *Trenton's* decks. The mizzen-mast and the mainmast soon went by the board. In the morning the seas had gone down considerably and the crew was sent on shore in boats.

The following is the list of the lost:

Capt. C. M. Schoonmaker.	N. B. Green, bayman.
Paymaster Frank H. Arms.	H. P. Stalman, bayman.
First Lieut. F. E. Sutton, U. S. Marine Corps.	C. H. Hawkins, st. steward.
Pay Clerk John Roche.	G. H. Wells, private marine.
George Murrage, B. M.	C. E. G. Stanford, landsman.
E. M. Hammer, seaman.	W. Bransbane, cabin steward.
George Gorman, carpenter.	Joseph Griffin, first-class fireman.
M. Craigin, captain after-guard.	M. Erickson, ordinary seaman.
William Brown, 1st quartermaster.	Thomas Kelly, second-class fireman.
T. G. Downey, paymaster's yeoman.	W. Howat, C. H.
B. F. Davis, engineer's yeoman.	C. P. Kratzer, ordinary seaman.
Thomas Riley, landsman.	M. H. Joseph, eq. yeoman.
John Kelly, ordinary seaman.	George Jordan, private marine.
Henry Baker, landsman.	John Willford, private seaman.
John Hanchett, sergeant.	Henry Wixted, private marine.
Frank Liesman, sergeant.	Aylmer Montgomerie, private marine.
Michael Cashen, corporal.	John Sims, private marine.
Nicholas Kinsella, corporal.	Charles Kraus, private marine.
H. C. Gehring, private marine.	Ah Kean, cabin cook.
Adolf Goldner, private marine.	Ah Pack, seamen's cook.
Frank Jones, private marine.	Ten Dang, landsman.
	Yee Hor, wardroom cook.

The *Vandalia* is a total loss. Her rail is awash and she is filling with sand. There is nothing standing except the foremast. The safe has been brought on shore, but aside from that the articles recovered will be insignificant. The crew is at work doing everything possible in the way of wrecking.

All records having been lost, this report is devoid of data concerning wind, weather, barometer, etc.

The loss of the *Vandalia* was due to the extreme violence of the gale, the great height of the seas, the extraordinary strength of the current, poor holding ground, and the unprotected condition of a small harbor fringed with coral reefs and crowded with vessels.

Very respectfully,

J. W. CARLIN,  
Lieutenant, U. S. Navy,

*Executive Officer U. S. Vandalia, Commanding Survivors.*

Rear-Admiral L. A. KIMBERLY, U. S. Navy,  
*Commanding U. S. Naval Force on Pacific Station.*

#### REPORT OF BOARD OF INVESTIGATION.

APIA, SAMOA, March 20, 1889.

SIR: In obedience to your order of the 18th instant, herewith appended, marked A, we have the honor to report as follows:

The cause of the losses of the *Nipsic*, *Trenton*, and *Vandalia*, by being driven on shore and the sinking of the *Vandalia* and *Trenton*, was the hurricane of March 16 last.

The *Vandalia* is sunk so that her poop and forecabin are at the water's edge at half tide. Her foremast is standing. The ship is well broken up, as evidenced by the divers finding the wardroom filling with sand. The rigging of foremast, the foretop-sail yard, and the foreyard can be saved. So also might her battery and stores, in a damaged condition, provided there were divers and wrecking facilities. As it is, it is proba-

ble that she will continue to go to pieces, so that another gale or time will shortly finish her destruction.

Her loss in officers and men is as follows, viz:

Capt. C. M. Schoonmaker.	M. Craigan, captain after-guard.
Paymaster F. H. Arns.	Wm. Brown, first quartermaster.
Paymaster's Clerk John Roche.	F. G. Downy, paymaster's yeoman.
First Lient. F. E. Sutton, U. S. Marine Corps.	M. H. Joseph, eq., yeoman.
John Hantchett, first sergeant.	B. F. Davis, engineer's yeoman.
Frauk Lissman, sergeant.	N. B. Green, bayman.
Michael Cashen, corporal.	H. P. Stalman, bayman.
Nicholas Kinsella, corporal.	Pen Dang, landsman.
H. C. Gehring, private marine.	Yee Hor, wardroom cook.
Adolph Goldner, private marine.	Ah Keau, cabin cook.
Frank Jones, private marine.	Ah Pack, seamen's cook.
George Jordan, private marine.	C. H. Hawkins, steerage steward.
John Willford, private marine.	C. E. G. Stanford, landsman.
Henry Wixted, private marine.	William Brisbane, C. S.
Aylmer Montgomerie, private marine.	Thomas Killy, first-class fireman.
John Sims, private marine.	Joseph Griffin, first-class fireman.
G. H. Wells, private marine.	M. Erickson, ordinary seaman.
Charles Kraus, private marine.	W. Howat, coal heaver.
George Murrage, boatswain's mate.	C. P. Kratzer, ordinary seaman.
E. M. Hammer, seaman.	Thomas Riley, ordinary seaman.
G. Gorman, carpenter.	John Kelly, ordinary seaman.
	Henry Baker, landsman.

Statement of her commanding officer appended, marked B.

The *Trenton* is sunk to her gun-deck. Statement of her commanding officer appended, marked C.

With proper wrecking facilities almost everything could be saved. As it is, everything above the gun-deck will probably be, unless a gale should break her up. It is hoped that, with the aid of our divers, a diving suit having been obtained from H. M. S. *Calliope*, a greater part of her stores will be saved. The *Trenton* seems to be broken in two places, one abreast of the mizzen-mast, the other near the smoke-stack, and can not be saved.

The *Nipsic* is now afloat, with the following damages, as per statements of commanding officer, navigator, and chief engineer, marked D, E, and F. Forefoot gone: port main-chains carried away; port mizzen-chains carried away; mainmast head sprung; steam-launch, second cutter, whale-boat, and dinghy all gone. Sailing launch badly damaged; deck seams opened on quarter-deck; stern-post and rudder gone; main-yard gone; upper section of smoke-stack carried away and lower section badly damaged; both after ventilators gone. In the ordnance department many articles, such as priming-wires, cartridge-boxes, belts, lock-strings, etc., were either damaged by salt-water or washed overboard. In the navigation department, such articles as deck-lamps, log-lines, and leads were swept overboard; the three working chronometers and comparing watch have been rendered useless by being filled with salt-water, the seas coming down the wardroom hatch. In examining the magazine 4 inches of water were found therein, but it is now comparatively dry. More or less water was found in the store-rooms of the paymaster, containing provisions and clothing.

In the engineer's department boilers No. 5 and 6 have spread about 3 inches, bending the tie-rods and lugs attached to after ends; the forward cylinders of main engines appear to be raised about 2½ inches; the after bunker (starboard side) is carried away along the lower edge. There is now every indication that between the turn of the bilge, starboard side, and keel, from about boiler No. 3 to center line of main engine, it has raised from 3 to 4 inches. The engines can not be jacked a full revolution, showing that they are considerably out of line. The

steam-pumps are in good condition, and also the distilling apparatus. No. 6 boiler leaks badly; side rods of low-pressure engines bent up; deck beams of after smoke-pipe carried away; auxiliary piping above boilers broken off; safety-valve No. 4 boiler bent; floor plates in fire-room will not go into their proper places; jacket of high-pressure cylinder cracked across; forward cylinder raised  $1\frac{1}{2}$  inches. The rudder and rudder-post are gone; three propeller-blades twisted and one broken; connection (shoe) between stern-post and rudder-post carried away; stern-post damaged at after end; false keel broken off, and copper strips, two sheets wide, gone to after end of mizzen-chains on star-board side. The planks are in good condition, but have the copper stripped off in places.

We are of the opinion that it would be unsafe to send the *Nipsic* in her present condition to either Honolulu or San Francisco, as these ports are distant and to windward. We are, however, of the opinion that when good weather sets in she might be towed or conveyed to some leeward port, as Auckland, to be docked and repaired.

Very respectfully,

N. H. FARQUHAR,  
*Captain, U. S. Navy.*  
D. W. MULLAN,  
*Commander, U. S. Navy.*  
J. W. CARLIN,  
*Lieutenant, U. S. Navy.*

A.

APIA, SAMOA, March 18, 1889.

SIR: You are appointed the senior member of a board to investigate and report on the causes and condition of losses and present condition of the *Nipsic*, *Trenton*, and *Vandalia*, driven on shore, and in two cases sunken, respectively, the *Vandalia* and the *Trenton*.

You will also state your opinion in regard to the *Nipsic*, as to whether she can be got into deep water and as to whether she can be rendered seaworthy to proceed either to Honolulu or San Francisco.

Very respectfully,

L. A. KIMBERLY,  
*Rear-Admiral, U. S. Navy,*  
*Commanding U. S. Naval Force on Pacific Station.*

Captain FARQUHAR,  
*U. S. Navy.*

B.

STATEMENT OF LIEUT. J. W. CARLIN, U. S. NAVY, EXECUTIVE OFFICER, U. S. S. VANDALIA, AND COMMANDING SURVIVORS.

APIA, SAMOA, March 19, 1889.

On the 15th and 16th instant a terrible gale swept over Apia, wrecking or beaching every craft in the harbor except H. B. M. S. *Calliope*, a powerful steamer, which put to sea at the height of the gale.

The *Vandalia* was prepared for heavy weather, with steam up, lower yards down, topmasts housed, and everything secured for sea. She was moored with her anchors northeast and east and southwest and west, 45 fathoms on each chain. The shifts of wind before the final blow came on put on elbow in the hawse. There was but one sheet anchor and that had a broken stock, the result of the gale a week before. It was held in reserve as long as possible in expectation of the wind coming out from northward and westward. It was let go about 4 a. m. well over to eastern reef. It was about that time that we began to drag the anchors and began to steam up to them. From 6 a. m. till 9 a. m. we were a dozen times in danger of fouling the *Calliope*, the nicest calculation being required to keep clear of her and the western reef. We were frequently within half a ship's length of that reef and several times within 50

feet. We could not bring her head to the wind and sea on account of a very strong current coming in along the western reef. We could not go to sea, because we were too close to the reef to clear it when the chains were slipped. All our chains were tending on starboard bow.

When the *Calliope* went to sea we attempted to get into the inner harbor, dragging the three anchors after us, and passing between the *Olga* and the lee reef, with but a few feet to spare on either hand. We slipped the sheet-chain to avoid fouling the *Olga's* anchors and veered both bower-chains to clear the ship herself.

It was found impossible to get into the middle of the channel or to bring the ship head to wind, and at about 10.45 the ship struck on the western reef. She began to fill and settle, and in a short time the rail was awash, with the seas washing over her at a height of at least 15 feet above the rail. The boats were all gone except steam-launch and second cutter. The state of the sea forbade an attempt to lower, though there were volunteers for the hazardous task.

Several officers and men were washed overboard from the poop, among them the commanding officer about half an hour after she struck. All the people then took refuge in the rigging, and from time to time many attempted to swim to the shore, but the greater portion were drowned in the attempt. A few reached the *Nipisic* by means of a line, though more were drowned than saved. The natives and other shore people were of infinite assistance in rescuing swimmers from the surf.

The *Trenton* dragged down on us about dark, which was regarded as an additional calamity, but which proved to be our salvation, as the men escaped from their dangerous position in the rigging to the comparative safety of the *Trenton's* deck. The main and mizzen masts went by the board half an hour or so after the *Trenton* came down on us. The next morning the seas having gone down all the people were transferred to the shore. A muster showed four officers and thirty-nine men missing and presumably dead. The officers were Captain Schoonmaker, Paymaster Arms, First Lieutenant Sutton, U. S. Marine Corps, and Pay Clerk John Roche.

The *Vandalia* is a total wreck, nothing standing except the foremast. Her rail is under water and she is filling with sand. The safe has been recovered and our men are doing what they can in the way of wrecking.

All our records were lost and the above statement is therefore devoid of data regarding wind, weather, barometer, etc. The lowest point of barometer was 29.17, on the forenoon of the 16th.

Very respectfully,

J. W. CARLIN,  
Lieutenant, U. S. Navy, Commanding Survivors.

### C.

#### STATEMENT OF CAPTAIN N. H. FARQUHAR, U. S. NAVY.

APIA, SAMOA, March 19, 1889.

The *Trenton* dragged alongside the U. S. S. *Vandalia*, which vessel was alongside a reef in the harbor of Apia, in a hurricane on March 16, 1889. During the gale rudder and rudder-post were carried away, and the fires put out by water taken into the ship.

The ship is sunk and her back is broken; in my opinion for want of docks and other facilities can not be saved. A properly equipped wrecking company could save everything in her.

The small arms and ammunition, field and Hotchkiss guns have been landed, as well as all of the provisions that could be taken from the holds. Such boats as were not carried away, and in general everything on and above the gun deck, will be saved by us.

The only loss of life was J. Hewlett, landsman, who was killed by a sea when the bridle port was stove in.

The rudder, rudder-post, and wheel were carried away early in the day; the propeller is also gone. The German corvette *Olga* collided with us, carrying away both quarter galleries, the Hotchkiss guns that were mounted on them, as well as completely destroying the barge gig and first cutter. The head-booms were carried away by the sea; both bowers and starboard sheet-chains parted.

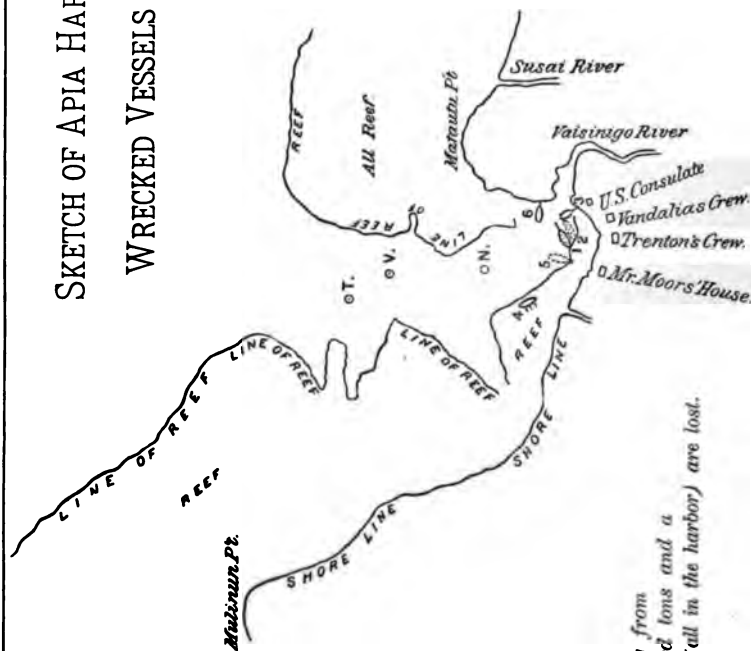
Very respectfully,

N. H. FARQUHAR,  
Captain, U. S. Navy, Commanding.





# SKETCH OF APIA HARBOR SHOWING POSITION OF WRECKED VESSELS AFTER THE GALE, ETC.



Six merchantmen ranging from  
twenty-five to five hundred tons and a  
number of smaller craft (all in the harbor) are lost.

- |         |   |                                     |
|---------|---|-------------------------------------|
| U. S.   | { | 1.—Trenton, sunk to gun deck.       |
|         |   | 2.—Vandalia, sunk to rail.          |
|         |   | 3.—Nipsic, beached but now afloat.  |
|         |   | 4.—Adler, capsized on reef.         |
|         |   | 5.—Eber, entirely disappeared.      |
|         |   | 6.—Olga, beached.                   |
| German. | { | T.—Trenton's berth before the gale. |
|         |   | V.—Vandalia's " " "                 |
|         |   | N.—Nipsic's " " "                   |
|         |   |                                     |

A P I A .

0 Scale Sea mile 1.

10 Cables.

as his experience during the night and his extreme coolness made him a most valuable assistant.

C. W. Johnson (seaman) made a gallant attempt to take a line to the *Nipsic*.

Apostola Callarito (2 of.) swam to the *Nipsic*, got a line from her to the *Vandalia*, and saved the lives of about a dozen men.

After several failures to swim to the shore with a line, one of which resulted in the death of the swimmer, William Fooye (seaman) came to me quietly and we talked over the situation while watching the currents, swimmers, and driftwood. He then offered to take a line on shore but the attempt was forbidden. Fooye is the subject of General Order No. 368.

Sergeant John Coleman and Private Carroll, U. S. Marine Corps, volunteered for duty in the fire-room, and remained in the coal-bunkers when the danger appalled the stoutest heart. Coleman has a medal for valor already. Ah Kee, a Chinese wardroom boy, weighing about 100 pounds, was seen dragging Paymaster Arms from the overwhelming waters, and afterwards holding or trying to hold him to the standard of a compass.

George Merrage (boat's mate), William Brown (quartermaster), E. M. Hammar (seaman), and William Howat, (coal heaver), who were drowned during the gale, were conspicuous for skill and valor, and will live forever in the hearts of their comrades.

This does not complete the list of gallant acts and brave men. Danger and suffering have effaced from the memory many deeds of valor, and it is claimed for the men in general that their conduct before, during, and after the gale, will bear the closest inspection, and now that the lips of their gallant commander are closed forever, the executive officer raises his voice in their behalf, with the earnest hope that, as they have left a clean wake, they may have a fair wind in all time to come, and that they may encounter only the waves of prosperity in their course.

Very respectfully,

J. W. CARLIN,  
*Lieutenant U. S. Navy, Executive Officer of the  
U. S. S. Vandalia, and Commanding Survivors.*

Hon. B. F. TRACY,  
*Secretary of the Navy, Washington, D. C.*

COMMANDANT'S OFFICE,  
*Navy Yard, Mare Island, Cal., May 22, 1889.*

Forwarded.

A. E. K. BENHAM,  
*Commodore, Commandant.*

Lieutenant Carlin showed himself a worthy leader of brave men.

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ADDITIONAL REPORT OF REAR-ADMIRAL L. A. KIMBERLY; CONDITION  
OF VESSELS.

UNITED STATES CONSULATE,  
*Apia, Samoa, March 21, 1889.*

SIR: The *Nipsic* was off last night, and is now afloat without rudder or rudder-post, and her crew is engaged in trying to get up her chains. The *Trenton* is sunk, the water coming over the port side of her gun-

deck at high water. I think her back is broken. She might possibly be freed from water if we had the proper appliances—powerful steam-pumps, etc. She has no rudder, rudder post, or propeller, and lies with her deck slightly inclined to seaward. She lies alongside of the wreck of the *Vandalia*, which is shoreward of her. The latter vessel is a total wreck and broken in two. At high tide the water rises over her top-gallant fore-castle; only her foremast is standing. We are engaged securing moorings for the *Nipsic* and in wrecking the *Trenton* and *Vandalia*. A good deal of what we save might be sold at public auction, to save expense of storing and transportation. Our sick and injured are doing well. It would perhaps be well to send a wrecking vessel here later in the season, to save the *Trenton's* heavy guns, ammunition, etc. I have received from Capt. Henry C. Kane, Royal Navy, a diving suit and apparatus, and will use for all it is worth, but we ought to have another in case of accident to this.

I hope the Department will not forget Captain Kane's kindness to us in our distress; he commands H. B. M. S. *Calliope*, which vessel having but one boat, I gave to her one of our ten-oared cutters. As she did not consider it safe to lie here at this season of the year, she has sailed this morning for Sydney, where she will be repaired, as she was considerably damaged by the *Olga* colliding with her. Almost every vessel was at one time or another in collision with some other vessel, and a great deal of the damage which occurred was owing to this cause.

If I can save the *Nipsic*, which can be done if the weather permits, I will send her under convoy to Auckland to be docked and repaired. Another ship should be sent here for the purpose of convoying her, as the risk of an improvised rudder is too great to send her there alone. I have still to learn of the condition of her machinery and propeller, but shall be informed in the course of a few days.

Very respectfully, your obedient servant,

L. A. KIMBERLY,  
Rear-Admiral, U. S. Navy,

Commanding U. S. Naval Force on Pacific Station.

THE SECRETARY OF THE NAVY.

REPORTS OF REAR-ADMIRAL KIMBERLY OF ASSISTANCE RENDERED.

APIA, SAMOA, March 19, 1889.

SIR: I have to commend to the Government of the United States the very great assistance we have received, in saving the public property from our wrecked vessels at this place, from Mataafa Malietoa, who, without any request on my part, called on me personally and sent some hundreds of his men to assist our people in saving stores and materials from the wrecked vessels.

Also when the *Nipsic* and *Vandalia* went on shore the natives risked their lives to save those of our men who endeavored to reach the shore by swimming, and two of them lost their lives in these attempts.

If some recognition of these services could be made I think it would be appreciated very highly by the Samoans, particularly as they have so generally given their services and in two cases their lives to befriend us.

Very respectfully, your obedient servant,

L. A. KIMBERLY,  
Rear-Admiral, U. S. Navy,

Commanding U. S. Naval Force on Pacific Station.

HON. W. C. WHITNEY,  
Secretary of the Navy.

APIA, SAMOA, *March 20, 1889.*

SIR: I have the honor to report that, at my request, Captain Kane, of H. B. M. S. *Calliope*, kindly gave me the complete diving apparatus belonging to his vessel, and I trust the Department will take the necessary steps to replace it.

Very respectfully, your obedient servant,

L. A. KIMBERLY,  
*Rear-Admiral, U. S. Navy,*  
*Commanding U. S. Naval Force on Pacific Station.*

Hon. W. C. WHITNEY,  
*Secretary of the Navy.*

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APIA, SAMOA, *March 26, 1889.*

SIR: Seumanu, Tafa, chief of Apia, was the first to man a boat and come to the *Trenton* after she struck the reef; he also rendered invaluable assistance in directing the natives engaged in taking our people and public property on shore on the 17th and 18th of March, and was of great service in many ways to all of us. I most sincerely wish that for his services the Department will reward him, as I believe that in the future he may prove of great service to shipwrecked sailors.

As a suitable present I would suggest a double-banked whale-boat, with its fittings, for Seumanu, and a suitable sum of money or other present for the following men, who composed his boats' crews, viz: Seumanu, chief of Apia, understands and speaks English; Muniaiga, generally known as "Jack," speaks English very well; Anapu, son of Seumanu; Tanpau, Chief Manono; Mose, Fuapopo, Tete, Pita, Ionia, Apiti, Auvaa, Alo, Tepu.

Very respectfully, your obedient servant,

L. A. KIMBERLY,  
*Rear-Admiral U. S. Navy,*  
*Commanding U. S. Naval Force on Pacific Station.*

THE SECRETARY OF THE NAVY.

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SECRETARY OF THE NAVY TO REAR-ADMIRAL KIMBERLY—ACKNOWLEDGMENT OF ASSISTANCE RENDERED.

NAVY DEPARTMENT,  
*Washington, April 27, 1889.*

SIR: The Department is in receipt of your letters of the 19th and 26th of March, describing the great assistance rendered to you by Mataafa Malietoa in sending a large force of his own men to take part in saving stores and materials from the wrecked vessels, and also informing the Department of the courage and self-devotion of the Chief Seumanu Tafa and his boat's crew, in risking their lives to rescue the officers and crew of the *Trenton*.

I have to inform you that the Department has addressed letters to the Secretary of State requesting him to express through the proper channel its high sense of the bravery and generosity of the Samoans in bringing succor to the shipwrecked officers and men of your squadron, and that it has adopted your recommendations that some substantial recognition of these services should be made by the United States Government.

The Department has also to acknowledge the receipt of your letter of the 20th of March, stating that at your request Capt. Henry C. Kane, Royal Navy, commanding Her Majesty's ship *Calliope*, generously placed at your disposal the diving apparatus belonging to that vessel, thereby materially assisting you in your effort to repair the damages caused by the recent storm and to recover property lost in the wreck of the vessels.

I have to inform you that the Department has addressed a letter to the Secretary of State upon this subject, expressing its desire to repay the cost of the *Calliope's* diving apparatus, and requesting that a tender of the amount may be made on its behalf to the Admiralty. It is further requested that the thanks of the Department be conveyed to Her Majesty's Government, and through it to Captain Kane, for the assistance so generously rendered by him to the United States squadron in distress.

Very respectfully,

B. F. TRACY,  
*Secretary of the Navy.*

Rear-Admiral L. A. KIMBERLY, U. S. Navy,  
*Commanding U. S. Naval Force on the Pacific Station, Apia, Samoa.*

SECRETARY OF THE NAVY TO BUREAU OF CONSTRUCTION—BOAT FOR  
CHIEF SEAMANU.

NAVY DEPARTMENT,  
*Washington, May 24, 1889.*

SIR: Upon the recommendation of Rear-Admiral Kimberly, and as a mark of appreciation of the valuable assistance rendered by Chief Seamanu to the shipwrecked vessels at Apia, the Department proposes to present him with a double-banked whale-boat, with its fittings, and has to direct that you will take the necessary steps to have a suitable boat prepared in California for this purpose.

Very respectfully,

B. F. TRACY,  
*Secretary of the Navy.*

The CHIEF OF THE BUREAU OF CONSTRUCTION AND REPAIR,  
*Navy Department, Washington, D. C.*

SECRETARY OF THE NAVY TO THE SECRETARY OF STATE—ACKNOWLEDGMENT OF SERVICES OF CAPT. H. C. KANE, R. N.

NAVY DEPARTMENT,  
*Washington, D. C., April 27, 1889.*

SIR: The Navy Department is informed by Rear-Admiral L. A. Kimberly, U. S. Navy, commanding the United States naval force on the Pacific station, in a letter dated Apia, Samoa, March 20, 1889, that at Rear-Admiral Kimberly's request Capt. Henry C. Kane, Royal Navy, commanding Her Britannic Majesty's ship *Calliope*, placed at his disposal a complete diving apparatus belonging to that vessel, thereby materially assisting the United States forces in their efforts to ascertain and repair the damages caused by the recent storm at Apia, and to recover property of the United States which was lost in the wreck of the vessels.

The Department desires to repay the cost of the diving apparatus of the *Calliope*, and request that the United States minister at London may be directed to ascertain from the Admiralty its value, and to tender the amount on behalf of the Navy Department; and it further asks that the grateful acknowledgments of this Department may be conveyed to Her Majesty's Government, and through it to Captain Kane, for the assistance so generously rendered by him to the United States squadron in distress.

I have the honor to be, sir, very respectfully, your obedient servant,

B. F. TRACY,  
*Secretary of the Navy.*

The SECRETARY OF STATE.

SECRETARY OF THE NAVY TO THE SECRETARY OF STATE—ACKNOWLEDGING ASSISTANCE BY NATIVES OF SAMOA.

NAVY DEPARTMENT,  
Washington, D. C., April 27, 1889.

SIR: In a report dated Apia, Samoa, March 26, 1889, from Rear-admiral L. A. Kimberly, U. S. Navy, commanding the United States naval force on the Pacific station, the Navy Department is informed that invaluable assistance was rendered by certain natives of Samoa to the shipwrecked vessels at Apia, during the storm of Saturday, the 16th March. Rear-Admiral Kimberly calls particular attention to Seumanu Tafa, chief of Apia, who was the first to man a boat and go to the *Trenton* after she struck the reef, and who also rendered material aid in directing the natives engaged in taking our people and public property on shore on the 17th and 18th. Special commendation also is given to the men composing his boat's crew, as follows: Muniaga, Anapu, son of Seumanu, Taupau, chief of Manono, Mose, Fuapopo, Tete, Pita, Ionia, Apiti, Auvaa, Alo, Tepu.

The Department has the honor to request that you will express to the authorities of Samoa, through the proper channels, its high sense of the courage and self-devotion of Chief Seumanu and his fellow-countrymen, in thus risking their lives to rescue the shipwrecked officers and crew of the *Trenton* from their position of peril and distress; and that you will, at the same time, inform them of its intention to send to the Chief Seumanu, in accordance with the recommendation of Rear-Admiral Kimberly, and as a mark of its appreciation, a double-banked whale-boat, with its fittings, and to reward suitably the men composing his crew, for their brave and disinterested services.

I have the honor to be, sir, very respectfully, your obedient servant,

B. F. TRACY,  
*Secretary of the Navy.*

The SECRETARY OF STATE.

SECRETARY OF THE NAVY TO THE SECRETARY OF STATE ACKNOWLEDGING ASSISTANCE BY MATAAFA MALIETOA.

NAVY DEPARTMENT,  
Washington, D. C., April 27, 1889.

SIR: I have the honor to inclose herewith a copy of a report of Rear-Admiral L. A. Kimberly, U. S. Navy, commanding the United States naval force on the Pacific station, dated Apia, Samoa, March 19,

1889, describing the very great assistance in saving the public property after the wreck at Apia received by him from Mataafa Malietoa, without any request on the part of Rear-Admiral Kimberly, called upon him personally and sent some hundreds of his own men to assist United States forces in saving stores and materials from the wrecked vessels.

Rear-Admiral Kimberly further states that when the *Nipsic* and *Vandalia* went on shore the natives risked their lives to save those of our men who endeavored to reach the shore by swimming, and two of them lost their lives in these attempts.

I have the honor to request that the cordial thanks of the Department for the valuable and generous services of Mataafa and his men may be conveyed to him through the proper channels; and I would further add that the suggestion of Rear-Admiral Kimberly that a substantial recognition of these services should be made by the United States Government is favorably regarded by this Department and is submitted to the Department of State for its consideration and for its action as it may deem wise to take in the matter.

I have the honor to be, sir, very respectfully, your obedient servant,

B. F. TRACY,  
*Secretary of the Navy.*

The SECRETARY OF STATE.

**SPECIAL REPORT OF REAR-ADMIRAL L. A. KIMBERLY—CONDUCT OF OFFICERS AND MEN.**

APIA, SAMOA, April 16, 1889.

SIR: I take pleasure in calling the attention of the Department to the efficient and indefatigable services rendered by the following officers, who were on shore or who reached the shore during the recent hurricane at Apia, which was so destructive of life and property:

Ensign John L. Purcell, U. S. Navy.

Lieut. John A. Shearman, U. S. Navy.

Ensign H. P. Jones, U. S. Navy.

Ensign H. A. Field, U. S. Navy.

These officers worked incessantly, doing all that it was possible to do saving the *Nipsic*, in efforts to launch boats and get lines to the *Vandalia*, and in patrolling the beach and saving life. They all worked until overcome by physical exhaustion. Ensign Field was in ill health when he left the ship and worked until 4 p. m., when he succumbed. He has since been on the sick-list and died unto death. Ensign Purcell and Lieutenant Shearman did not yield until after midnight and were promptly at hand early the following morning. Ensign Jones, in addition to his services on the shore, is highly commended by his commanding officer in a letter to me of March 26, of which the following is an extract:

I beg to call your attention particularly to the valuable services of Ensign H. P. Jones, jr., who was officer of the deck of the morning watch and who superintended the steering of this ship properly and carefully for two long hours to prevent the *Olga* from cutting us down. He stood bravely at his post by my side on the poop through all the storm, rain, and volumes of smoke, when at times we could see but a few feet ahead, as the blinding smoke and heat were simply terrible. Mr. Jones is a young officer of great promise, and bids fair to be of value to the service and his country.

Ensign C. S. Ripley and Pay Clerk S. T. Browne are worthy of notice for their active efforts and the valuable assistance they rendered.

Teoteo, a Samoan of Apia, made a desperate attempt to swim off to the *Vandalia* with a line while the gale was at its height. The heavy surf, the jagged reef strewn with wreckage and swept by strong currents, through and over which he attempted to pass, made this effort one of exceeding danger, and in the futile attempt he nearly lost his life. I have learned of no greater risk of life for others being accepted by any one on this occasion, and I commend him to the favorable consideration of the Department, trusting that his bravery will be recognized in so enduring a manner that his example will be kept in memory and the spirit that animated him fostered and developed wherever acts of courage and sacrifice are cherished. In his intrepid effort Teoteo was assisted in the management of the line by Toga, a native of Samoa, whose father was a Tongan.

Charles Fruen, sr., a native of Apia, saved the life of Surgeon E. Z. Derr, of the *Nipsic*, and in doing so risked his own.

Seumanutafa, chief of Apia, and Selu Leáuánae did excellent service in saving life, and took the lead in directing the work of the natives. They organized boats' crews and carried out the suggestions of the officers. Seumanutafa took charge of and steered the boat which was the first to carry lines to the wrecks in the early morning of the 17th, while it was yet dark, and the passage across the reef and the approach to the *Trenton* beset with difficulty and danger.

All the Samoans were faithful, alert, and diligent in their efforts to save life and assist the unfortunate people. Conspicuous among them were the following:

Tatopan.

Paniola.

Sigito.

Fauala.

Folan.

Charles Fruen, jr.

Sofa.

Tualagi.

Papalii.

Muniaiinga.

William Hunkin.

Neamea.

Of the foreign residents of Apia, the United States vice-consul, Mr. W. Blacklock, was pre-eminently conspicuous for his energy and good services, not only in saving life, but in caring for the immediate and pressing wants of the survivors of the *Vandalia*, the most of whom were taken to the consulate. Too much can not be said in justice to his exertions and hospitality on this occasion.

Mr. J. P. Dunning, correspondent of the Associated Press, and Messrs. H. J. Moore, Albert Vicking, Peter Paul, and J. S. Pike, of Apia, were conspicuous in the work of saving life and property, and deserve particular mention in this regard for most praiseworthy services.

From a letter by Commander Mullan, of the *Nipsic*, dated April 26, I quote as follows:

Among my own crew those who rendered services and set examples were John Callahan (quartermaster), who had the mid-watch on the night of March 16, and who was stationed on the quarter to watch the movements of the *Eber*, which vessel was close under our stern, and to report her approach to the officer of the deck, who was watching the *Olga*, close on our port beam; also Quartermaster R. H. Taylor, who was at the conn from 4 a. m. to the time the vessel was beached, never leaving it once, but conning the vessel amid the volumes of smoke and soot which were sweeping aft after the smoke-pipe had been carried away. We were steaming ahead through the night watches. James Lane and Henry Pontseel, seamen, were at the wheel from 1 a. m. till the vessel struck and during the collision with the *Olga*, and remained there without flinching. I regret to say that Pontseel was drowned. Chief Boatswain's Mate John Bradley and Boatswain's Mate William Cosgrove were very conspicuous during the night in doing all possible. Bradley has been a most valuable man to the *Nipsic*, and on more occasions than one has he shown himself a



thorough seaman. I would be pleased to see him get a boatswain's warrant, for which I now recommend him. He is our leading spirit in times of danger. Brooks Cason, quartermaster gunner, acted as my messenger during a good part of the night and assisted me greatly. He is a brave lad and always at the proper place in time of need. I would recommend the above-named men for medals of honor.

Sergeant Grupp and Private William Campbell, U. S. Marine Corps, were conspicuous in worthy and earnest efforts along the beach, aiding the officers and assisting in every undertaking to save life and property.

I commend to the notice of the Navy Department, Lieut. John M. Hawley, the executive officer of the *Nipsic*, for his zeal and energy in getting the *Nipsic* afloat after she beached. He had the entire charge of this work, and to his efforts in a large measure is due the fact that the *Nipsic* is now afloat without more serious injury, and with the possibility of future service to the Government.

Naval Cadets J. A. Le Jeune, L. A. Stafford, and H. A. Wiley, serving on the *Vandalia*, are commended as follows, by Lieutenant Carlin, commanding the survivors:

The gale was terrific and the danger extreme, the ship being on the brink of destruction for fifteen hours. These young officers did their duty in the most commendable manner, distinguishing themselves for coolness, zeal, and pluck.

I have in previous letters to the Department called its attention to the important services rendered me by Malietoa Mataafa, and to the exceeding kindness of Captain Kane, of H. B. M. S. *Calliope*. These services are fully described in my report dated March 19, Nos. 21 and 25; March 20, No. 22; and March 21, No. 23; but the subject-matter of the present letter would be fatally deficient without a marked reference to them.

I have endeavored in the foregoing to make a just statement of the worthy efforts made by the persons mentioned, my chief source of information being the written reports of eye-witnesses; and I now respectfully refer the matter to the Department with the statement of my conviction that prompt recognition and reward, commensurate with the character of the services rendered, will be but a simple act of justice, and in the cases of our own officers and men will operate to the great advantage of the service.

Very respectfully, your obedient servant,

L. A. KIMBERLY,

Rear Admiral U. S. Navy,

Commanding U. S. Naval Force on Pacific Station.

THE SECRETARY OF THE NAVY.

SECRETARY OF THE NAVY TO REAR ADMIRAL KIMBERLY—ACTION OF THE DEPARTMENT.

NAVY DEPARTMENT,

Washington, April 27, 1889.

SIR: The Department is in receipt of your cable dispatch of March 30, from Auckland, and also of your letter of March 19 from Samoa, with accompanying reports from Captain Farquhar, Commander Mulhan, and Lieutenant Carlin, narrating the circumstances of the overwhelming disaster which has recently befallen your squadron in Apia harbor.

I need not say to you that this event has caused the Department profound sorrow, which, as the appalling extent and character of the catastrophe became known, was reflected throughout the country. Even if the Navy were possessed of an adequate number of ships to supply the necessities of the service, the loss of three at one blow would be a serious diminution of the available cruising force. To a Navy passing, as is that of the United States, through a stage of transition, when most of its previously existing vessels have disappeared and its new fleet is only on the threshold of existence, the blow comes with crippling force.

The Department learns with the deepest pain that the wreck at Samoa resulted in the death of four officers, Captain C. M. Schoonmaker, Paymaster Frank H. Arms, First Lieut. F. E. Sutton of the Marine Corps, and Pay Clerk John Roche, and thirty-nine men of the *Vandalia*, seven men of the *Nipsic*, and one man of the *Trenton*. However severely the destruction of the vessels may be felt by the Navy, the loss of so many valuable lives is a far greater and more irreparable misfortune. Captain Schoonmaker died, as he had lived, at the post of duty, a gallant and generous officer, and a devoted servant of his country to the last. Weakened by long effort, he was swept by the sea from the deck of his vessel, soon after she had drifted to her final resting-place. The hurricane at Samoa has brought affliction to many American households, which will receive the deepest sympathy of the Government, yet it cannot be said that those who died thus manfully, facing danger in the execution of their duty, have died in vain.

The Department, having closely examined the reports of the circumstances under which the disaster occurred, learns that on the 15th of March, when indications of bad weather first appeared, every preparation was made to meet the coming gale. The ships were stripped and steam was raised. The force of the approaching storm could not be foreseen, and there was every reason to hope and believe that the vessels would ride it out at their moorings in safety. The extraordinary violence of the gale rendered this impossible, while the crowded condition of the harbor, where the vessels lay exposed to the full force of the wind and sea, yet shut in on both sides by the sharp edges of coral reefs, made their position one of extreme danger. The *Nipsic*, Commander Dennis W. Mullan, the innermost vessel of the fleet, was enabled to reach a place of comparative safety on the beach, where her gig's crew were lost while gallantly attempting to run a line to the shore. The *Vandalia*, commanded by Capt. C. M. Schoonmaker, and upon his death by Lieut. J. W. Carlin, after skillfully avoiding a collision as she dragged into the inner harbor struck the point of the reef not far from the *Nipsic*. Here she remained, exposed to the fury of the storm, her officers and men taking refuge in the rigging, while the seas swept over her and the spray and surf were flying to her mast-heads. Many of her crew were lost in the attempt to swim ashore, and one man, E. M. Hammer (seaman), met his death in a brave but fruitless effort to carry a line to the *Nipsic*. The survivors, after remaining for eight hours in momentary expectation of death, were finally rescued through the efforts of the *Trenton*. The latter vessel, Capt. Norman H. Farquhar commanding, had the misfortune early on the morning of the 16th to lose her wheel and break her rudder. Soon after the heavy sea, forcing its way into the hawse-holes in spite of obstructions, filled the fire-rooms and put out the fires. The flagship, now without steam or rudder, her anchors dragging, drifted almost at the mercy of the gale along the edges of the eastern reef, at times not more than 20 feet from total destruction. Every

endeavor was made to control her movements, and her commanding officer states in his report that upon at least one occasion it was through the excellent judgment of Lieut. R. M. G. Brown, the navigating officer, that the ship cleared the reef and the four hundred and fifty lives on board were saved. The Department notes with satisfaction your commendation of Lieutenant Brown and also of Lieut. Commander Henry W. Lyon, the executive officer, for their efforts to save the ship. After a collision with the *Olga* the *Trenton* passed over to the western reef, where she drifted with the current until she struck the ground near the *Vandalia*.

From your own report, and from other accounts that have reached the Department, it appears that the conduct of those under your command evinced throughout that courage, resolution, and fortitude which the United States has learned always to expect from the officers and seamen of its Navy. When her Britannic Majesty's ship *Calliope*, fortunate in the possession of more powerful engines, succeeded in her gallant effort to pass the *Trenton* and steam out of the harbor against the hurricane, the ringing cheer from the American flagship, as her crew were standing in the face of death, showed a spirit alike generous and dauntless. During the whole of Saturday, when the *Trenton* was helplessly dragging her anchors on the verge of destruction, the officers preserved their composure and heroic bearing, and directed her movements with consummate skill; the crew were thrown into the rigging as a substitute for sails, and through the cool and exact judgment of those charged with her guidance, she was enabled to escape the extremity of peril. Finally, at the close of the day, when she brought up alongside of the *Vandalia*, her officers and men, notwithstanding the suffering through which they had passed, and the dangers by which they were still surrounded, thought only of doing their utmost to assist their comrades of the *Vandalia*, whose distress was greater than their own, and by firing rockets with life lines over the masts and rigging of the sunken vessel, they succeeded in rescuing all those who had taken refuge there; while under the inspiration of a sentiment which has awakened a response in every American heart, the band of the flagship, to encourage those who, dazed with fatigue and weakened by exposure, were still clinging to the rigging, played the national anthem.

In reply to your request and that of Captain Farquhar for a court of inquiry, the Department has to say, that it deems such a court unnecessary. It is satisfied that the officers in command of the ships at Apia did their duty with courage, fidelity, and sound judgment, and that they were zealously and loyally seconded by their subordinates; that the hurricane which caused the destruction of the vessels and the loss of so many lives was one of those visitations of Providence in the presence of which human efforts are of little avail; that the measures actually taken by yourself and the officers under you were all that wisdom and prudence could dictate, and that it was due to these measures that so large a proportion of the crews were saved; that the one step which might have averted the catastrophe, namely, to have put to sea before the storm had developed, could only have been justified, in view of the grave responsibilities resting upon you at Samoa, by the certainty of overwhelming danger to your fleet, which could not then be foreseen; that you rightly decided to remain at your post, and that the Department, even in the face of the terrible disaster which it involved, approves absolutely your decision, which has set an example to the Navy that should never be forgotten.

To convene a court of inquiry under these circumstances would seem to imply a doubt on the part of the Department where no doubt exists; and instead of ordering an investigation, it tenders to you, and through you to the officers and men of your command, its sympathies for the exposures and hardships you have encountered, and its profound thanks for the fidelity with which you performed your duty in a crisis of appalling danger.

Very respectfully,

B. F. TRACY,  
*Secretary of the Navy.*

Rear-Admiral L. A. KIMBERLY, U. S. Navy,  
*Commanding U. S. Naval Force on the  
Pacific Station, Apia, Samoa.*

**No. 5.—REPORT OF THE COMMISSION TO SELECT A SITE FOR A  
NAVY-YARD ON THE PACIFIC COAST NORTH OF THE FORTY-  
SECOND PARALLEL OF NORTH LATITUDE.**

NAVY DEPARTMENT,  
*Washington, D. C., September 15, 1889.*

Hon. B. F. TRACY,  
*Secretary of the Navy:*

SIR: The Commission for selecting a site for a navy-yard on the Pacific coast of the United States, authorized by act of Congress approved September 7, 1888, and appointed by the Department's order of November 30, 1888, having completed the work assigned to it, submits, respectfully, the following report:

The text of the act of Congress above referred to, directing the appointment of the Commission, reads as follows:

For the expenses of a Commission of three officers, to be appointed by the Secretary of the Navy, to report as to the most desirable location on or near the coast of the Gulf of Mexico and the South Atlantic coast for navy-yards and dry-docks, and for the expenses of sounding and surveying and estimating expenses, fifteen thousand dollars. And the Secretary of the Navy be, and he is hereby, required to appoint a Commission composed of three competent naval officers, whose duty it shall be to examine the coast north of the forty-second parallel of north latitude, in the State of Oregon and Territories of Washington and Alaska, and select a suitable site, having due regard to the commercial and naval necessities of that coast, for a navy-yard and dry-docks; and having selected such site, shall, if upon private lands, estimate its value and ascertain the price for which it can be purchased, and of their proceedings and action make full and detailed report to the Secretary of the Navy; and the Secretary of the Navy shall transmit such report, with his recommendations, to Congress. That to defray the expenses of such Commission the sum of five thousand dollars of the above amount, or as much thereof as may be necessary, may be used.

The order of the Navy Department appointing the Commission, and directed to the senior officer, is as follows:

NAVY DEPARTMENT,  
*Washington, November 30, 1888.*

SIR: You are hereby appointed president of a Commission, under the act of Congress approved September 7, 1888, to select a site for a navy-yard on the Pacific coast of the United States north of the forty-second parallel of north latitude in the State of Oregon and Territories of Washington and Alaska. The Commission will carefully examine the coast of the State and Territories mentioned, and select a suitable site for a navy-yard and docks, having due regard for the commercial and naval necessities of that coast. Having selected a site, the Commission will, if it be upon private lands, estimate its value and ascertain the price for which it can be purchased. The Commission will make a full and detailed report upon the subject to the Secretary of the Navy as soon as practicable. Commander C. M. Chester and Lieutenant-Commander C. H. Stockton will be associated with you as members of the Commission. The Commission will meet at the Navy Department on the 3d of December next, and

you will accordingly proceed here for that purpose. After organizing, the Commission will visit the localities mentioned, and carry out these instructions.

A copy of the act of Congress, above referred to, is inclosed herewith for your information.

Very respectfully,

W. C. WHITNEY,  
*Secretary of the Navy.*

Capt. A. T. MAHAN, U. S. N.,  
*President Naval War College, Newport, R. I.*

Received December 7, 1888.

A. T. MAHAN,  
*Captain, U. S. N.*

Owing to a delay in issuing this order, the Commission did not meet until Monday, December 10, when the members assembled at the Navy Department.

Immediately after organizing, the president of the Commission laid before it the following letter of instructions from the Secretary of the Navy, summarizing, for the guidance of the Commission, the requisites essential to be found in the proposed yard:

NAVY DEPARTMENT,  
*Washington, D. C., November 30, 1888.*

SIR: As president of the Commission to select a site for a navy-yard upon the north-western Pacific coast, the following instructions are herewith furnished you for the information and guidance of the Commission:

The clause of the naval appropriation act which requires the appointment of the Commission states that its duty "shall be to examine the coast north of the forty-second parallel of north latitude in the State of Oregon and Territories of Washington and Alaska, and select a suitable site, having due regard to the commercial and naval necessities of that coast, for a navy-yard and docks; and having selected such site, shall, if upon private lands, estimate its value and ascertain the price for which it can be purchased; and of their proceedings and action make full and detailed report to the Secretary of the Navy."

In discharging your duty attention should be given to the following special requirements for a naval station:

First. A situation upon a good harbor, of sufficient size, depth, and accessibility for vessels of the largest size and heaviest draught.

Second. A favorable position with respect to the principal lines of defense.

Third. A local security from water attack due to position and natural surroundings.

Fourth. Ample water frontage of sufficient depth and permanence, and with currents of moderate rapidity.

Fifth. A favorable position with respect to the lines of interior communication (by rail or otherwise) with the principal sources of supplies.

Sixth. That the character of the ground shall be suitable for the construction of excavated docks and basins, and for heavy structures.

Seventh. Proximity to centers of labor and supplies of material.

Eighth. Healthiness of the climate and its suitability for out-of-door labor.

Ninth. The existence in the vicinity of an ample supply of good potable water.

Before leaving for the Pacific coast the Department desires you to place yourself in communication with the Chief of Engineers of the Army in order to ascertain the principal lines of defense for these waters as far as they are formulated; and also the works that are in progress, or under consideration, for the improvement of any harbors or waters that come within the scope of your examination.

It will also be advisable to obtain from the Coast Survey Office any hydrographic or other information which would be pertinent, and which is not to be found in the charts or publications of that office.

The commandant of the navy-yard, Mare Island, California, will be instructed to afford you all necessary assistance, and a vessel will be detailed for the purpose of performing any hydrographic work required and also for affording such transportation to the Commission as may be deemed necessary or advisable.

I am, very respectfully, your obedient servant,

W. C. WHITNEY,  
*Secretary of the Navy.*

Capt. A. T. MAHAN, U. S. N.

Having this letter before it, the Commission proceeded at once to an inspection of the Coast Survey and other charts, in order to familiarize the members with the characteristics of the coast which they were to examine, to determine what portions of it, or what harbors, offered probable advantages, and to eliminate such as, from their hydrographic features, were evidently unfitted for the establishment of an important yard.

At the same time there was addressed to the officials of the principal cities in the region to be visited, or to persons of reputation residing at smaller centers near possible sites for a navy-yard, a list of questions, twenty in number, as to the resources of the localities, the object being to afford them time to prepare as full a statement as they saw fit, for the information of the Commission when it should arrive. This list of questions is appended to the report and marked A.

While thus in Washington the Commission had several interviews with the Chief of Engineers and other officers of the Corps of Engineers, U. S. Army, with reference to works now in progress to improve the navigable waters of the Northwest coast, and to the fortifications contemplated for that coast. The Office of the U. S. Coast and Geodetic Survey was also consulted for the latest and fullest topographical and hydrographical data, and the Geological Survey for information as to the general character of the geology, as bearing upon foundations of buildings and excavation for docks.

On December 20 the president of the Commission went to New York to confer with the Army Fortification Board and obtain its present views as to the principal lines of defense. While there he was taken ill, and the departure of the Commission was thereby delayed nearly a month. It finally left for the Pacific coast January 22, 1889, and re-assembled in San Francisco February 1.

After obtaining some further information and making some arrangements about work, unnecessary to particularize, the Commission left San Francisco for Portland, Oregon, arriving there on February 8.

It had been the intention of the Commission to proceed at once with a personal examination of the Columbia River, but, after deliberation, this purpose was now changed for the reason that the Commission, while furnished with the fullest and most precise information as to the hydrography of the whole coast, including the Columbia River as far as the Willamette, on which Portland is, had been unable to obtain any details, authoritative or even definite, about the hydrography or topography of Lake Washington. This large body of fresh water, lying in Washington Territory, immediately east of the city of Seattle, and only 6 miles from Puget Sound, has been prominently discussed and advocated as the best site for a navy-yard. It was possible that the proper decision of the question might depend upon a close survey, determining accurately the depth of water and character of the shores over a great part of the lake; and if so, such survey should be begun with the least possible delay. The Commission therefore decided to proceed at once to Seattle and make a reconnaissance of the lake. Accordingly, after an interview with a committee of citizens of Portland and visiting some points of interest in the neighborhood, it started for Seattle February 12, reaching there February 13.

The following five weeks were spent in a minute examination of all the waters collectively known under the name of Puget Sound, together with the more important parts of the coast from Port Angeles, on the Straits of Juan de Fuca, eastward to and including, Bellingham Bay; also the Haro Archipelago, or San Juan group of islands.

The light-house tender *Manzanita* had been placed at the disposal of the Commission by the Light-House Board, and through the cordial cooperation of Lieutenant Sebree, U. S. Navy, the inspection was made under the most favorable conditions and in the most thorough manner.

During this time all points of interest indicated by the citizens of the different places were visited, when they seemed to have any bearing upon the object of the Commission.

On the 20th of March the Commission returned to Portland, received a visit from the citizens of Vancouver, Wash. (on the Columbia River, 6 miles from Portland), who desired to press the claims of their city as a proper site; and afterwards, having been furnished by the president of the Portland Board of Trade with a list of places on the Columbia which might be found suitable for a navy-yard, proceeded to Astoria. Here some other possible sites were suggested by the citizens of that place; and later the works for straightening and deepening the channel over the bar of the Columbia were visited, under the guidance of Major Handbury, of the U. S. Engineers, who is in charge and kindly consented to accompany the Commission from Portland. The following day the Commission returned to Portland in the *Manzanita*, which had been sent round from Puget Sound for that purpose by Lieutenant Sebree. The banks and islands of the Columbia were thus viewed by daylight, in the same manner as the shores of Puget Sound had been.

The Commission did not think it necessary to visit personally Alaska, nor any parts of the coast north of the forty-second parallel other than those already mentioned, for the reasons which will be hereafter set forth in the report, and which will also be found in the detailed record of proceedings hereto appended (marked F), which the Commission, by the terms of the act, was directed to submit, along with its report, to the Secretary of the Navy.

On the 24th of March the Commission, having finished its personal examination of the ground, selected the site it intended to recommend, and agreed upon the leading features of the report to be submitted, left Portland for the East.

Having given thus briefly a summary of its proceedings, which will be found more in detail in the appended record, the Commission now presents its conclusions upon the whole matter and its reasons for fixing on the site selected.

Neglecting for the moment\* Alaska, the coast-line of the United States on the Pacific from 42° N. to Cape Flattery, its northernmost point, may be stated at 500 nautical miles—550 statute miles. From San Francisco to 42° N. the distance following the shore line is 285 nautical, or over 300 statute miles. The distance from San Francisco to Cape Flattery is therefore close upon 900 miles.\*

In this long distance the character of the coast is most inhospitable. There are few harbors, and the shore is lashed by a sea so heavy as to break in the almost unexampled depths of 40 to 60 feet. With one exception, such harbors as do exist are unimportant from a commercial and naval point of view, on account of the shoalness and difficulty of their entrances. The one exception is the mouth of the Columbia River, which, while at times impassable, will generally admit the entrance and departure of ships of heavy, though not the heaviest, burden. Being the natural outlet of the great valley of the Columbia and of the extensive region tributary to it, this harbor possesses great commercial

\* The distance by rail from San Francisco to Tacoma, the terminus of the Northern Pacific Railroad on Puget Sound, is 891 miles.



importance and could undoubtedly contribute to the naval strength of the northwest coast; but it is not accessible to war ships of the heavier classes. The mouth of the Columbia is distant 140 miles from Cape Flattery and over 700 miles from San Francisco.

At Cape Flattery a broad arm of the sea, known as the Straits of Juan de Fuca, divides the United States from British Columbia. These straits have an average width of ten or twelve miles for a distance of fifty; after which they rapidly widen into Washington Sound and the Gulf of Georgia, the former of which belongs to the United States and contains the San Juan group of islands. These waters form a natural boundary between the United States and the British possessions until the parallel of 49 N. is reached, beyond which all belongs to Great Britain.

Eighty-five miles within the entrance of the Straits of Juan de Fuca, on the south side, is the opening to Puget Sound, a very extensive water area belonging wholly to the United States. The numerous ramifications of the Sound, the depth and quietness of its waters, the rich and extensive country surrounding it, and its ready access to the ocean, at all times, by channels both wide and clear, all combine to indicate it as a great commercial center of the future. The terminus of one of the great transcontinental lines is already on its shores; it is connected by rail with Portland and San Francisco; and branch lines of road will doubtless soon extend all along its eastern shore to the boundary of Canada, and open communications with the interior of Washington and Oregon.

The Straits of Fuca, Puget Sound, the Gulfs of Washington and Georgia, form by nature a single water system, between all parts of which exists easy and rapid communication, and which is easily accessible from the ocean. Such conditions would render such a water system of great military importance, even if it lay wholly within the territory of a single nation; but when the opposite shores of the main entrance are held, as in this case, by independent powers of the first class, when the interior waters are also divided between the two powers, and the termini of two great trans-continental railroads belonging to the one and the other are found there, the natural strategic situation is doubly emphasized.

The conditions imposed by nature are such as to make the naval forces the most important element in the control of the region in question. The Straits of Fuca, being over 10 miles wide and from 200 to 600 feet deep, can not be closed by either stationary fortifications or submarine mines. Farther in, the San Juan islands divide the approaches to the Gulf of Georgia into numerous comparatively narrow channels, and the entrance to Puget Sound is only 3 miles wide; but in both cases the depth of water continues too great to admit of torpedo defenses, and it is confessedly impossible to hold a passage against a modern fleet unless obstructions of some kind can be placed to impede its progress and detain it under the fire of the batteries.

There is found, therefore, in Puget and Washington Sounds and in the Straits of Juan de Fuca a great center and outlet of commercial activity, belonging to the United States, dependent entirely upon adequate naval force for its protection against an enemy. The Columbia River presents another such center, which can indeed receive passive defense against attack by forts and torpedoes, but in the absence of a naval force strong enough to prevent an enemy from holding his ground off the river its commerce by sea would be paralyzed.

These two regions are near enough to each other to be embraced in

the same scheme of naval operations, offensive as well as defensive. They are too far from San Francisco for such operations to depend upon its yard for repairs and supplies. No vigor can be sustained nor success expected when ships have to steam fifteen hundred miles, going and returning, in search of repair and supply. It may indeed be conceded that the shipping of every foreign power, save one, would be in this respect under a disadvantage greater than our own if attempting to operate in these regions; but the existence of one upon the strait imposes upon us the military necessity of having near at hand a yard in which necessary repairs, even if extensive, can be made without requiring the distant voyage to San Francisco. Such a voyage could not be made by a single disabled ship if our fleet were confronted by an equal, or nearly equal, enemy in the straits or on the coast. It must be remembered, too, that a slight injury, and easily remedied, may unfit a modern war-ship for a place in the order of battle until it is repaired. This is not a question of building ships; ships must now be built in time of peace. It is a question of establishing a base of operations, without which our military position on the northwest coast can not be maintained.

The situation of the outlying Territory of Alaska lends additional force to all these considerations. It can only be held by control of the sea, and such control can not be based on San Francisco. It would be a drawback to a fleet to have to traverse the distance which separates Alaska from the nearest possible naval base in the United States, but it would therein be under no disadvantage as compared with its enemy, except that a British fleet could use, for great part of the way, a passage interior to its own dominions. It must not be forgotten, as an element of the military situation, that by holding Vancouver Island Great Britain has two approaches to the Gulf of Georgia and the adjacent continent, while the United States has but one.

For the purposes of further and more detailed discussion the Pacific coast of the United States, north of the forty-second parallel (see Map I), will be divided under the following heads:

- I. The Pacific sea-board from the forty-second degree north to Cape Flattery.
- II. Alaska.
- III. The coast line on the straits of Juan de Fuca, from Cape Flattery eastward, to the frontier of British Columbia.
- IV. The San Juan Islands, or Haro Archipelago.
- V. Puget Sound; under which name is comprised all the extensive water area inside the headlands of Point Wilson and Admiralty Head, and the narrow independent entrance at Deception Pass.
- VI. Lake Washington; for although this fresh-water lake does not communicate with the sea by waters navigable, in the strict sense of the word, it has been too prominently mentioned in official papers as a fit place for a navy-yard to be overlooked in such a discussion as the present.

*I. The Pacific sea-board.*—The harbors or inlets of the sea on the Pacific coast south of Cape Flattery fall under two classes. First, the harbors with very shoal entrance, of which Koos Bay, Yaquina River, Shoalwater Bay, and Gray's Harbor are the most favorable examples; second, the Columbia River.

*First.*—Of the first class it is to be said that the water on the bar is

shoal, the channels shifting, and that the sea often breaks completely across the entrance. The improvements now in progress do not promise the entire removal of these defects, to which are probably due slight development of these places and their imperfect communication with the interior. The bad hydrographic conditions and scanty resources of the points in question being perfectly well established, the Commission did not think it necessary to make a personal examination by rejecting them as possible sites for a yard.

*Second.*—The Columbia River presents, though to a much less degree, the same difficulties which characterize the harbors just mentioned. The depth of water on the bar varies; by the statement of a pilot it is now 20 feet at mean low water, the same given by the Coast Survey charts as obtaining in September, 1887. The mean rise of the tide is 7 feet; and as allowance must be made for the rise and fall of ships pitching in the heavy sea that is met during a great part of the year, the underwriters do not accept risks on draughts over 22½ feet, even under the most favorable circumstances of weather. Ships with that draught are frequently detained for many days by the state of the bar. The natural channel, which still remains the main ship-channel, has been subject to extensive variations. The sea at times breaks heavily across and outside the bar; and while the regular mail steamers are rarely detained by it, they are so at times, though they draw only 18 to 20 feet of water, a draught which can not be accepted as approaching the maximum required for large ships-of-war.

By the works now in progress for the improvement of the bar of the Columbia River the engineer officers expect to substitute, for the present indirect and variable channel, a new one that shall be straight and permanent, and maintain a constant depth of 30 feet at mean low water. The Commission accepted this estimate to the same extent as the engineers; that is, as an expectation, not as a certainty. Aside, however, from the uncertainty, the depth hoped for can not be considered sufficient, in view of the extraordinarily heavy seas which mark the Pacific coast of the United States from San Francisco north. It is well established, by the testimony of many competent witnesses, that the sea along this coast frequently breaks in from 40 to 60 feet. Despite the improvements, therefore, the sea may be expected in the future to break on, or outside, the Columbia bar, and war-ships which nothing else could detain may be bar-bound at a time when the utmost expedition is required; a danger in military operations which should not be incurred when it can be avoided, as on the northwest coast it can. If nothing better than 30 feet could be had, the defect would have to be made the most of; but as far better hydrographic conditions, yielding perfect accessibility at all times to the heaviest ships, can be found not far away, the inadequate depth on the Columbia bar determined the Commission to reject that entrance, and consequently all positions within the river, as unsuitable for a navy-yard.

II. *Alaska.*—With respect to Alaska, the Commission decided that, as the charts show no probable site for a navy-yard; as the territory is separated from the rest of the United States by foreign territory, so that in case of hostilities a yard there would be cut off by a temporary loss of naval supremacy; as the resources in population and manufacture are so slight; and as the commercial and naval necessities of the northwest coast do not admit of a navy-yard being placed there, a navy-yard in that territory would be undesirable. The Commission, therefore, did not make a personal visit to Alaska.

III. The coast line from Cape Flattery eastward to the frontier of British Columbia may conveniently be divided into two sections: First, that lying west of Admiralty Inlet, the entrance to Puget Sound. Second, that lying east of the same inlet.

*First.*—In the former of these divisions there are some good harbors; but all, with the single exception of Port Discovery, are indefensible against naval attack. Port Discovery formerly offered admirable facilities for defense through the position of Protection Island; but under modern conditions the great depth of water in the channels on either side of that island forbids (at present) the successful use of torpedoes, without which, to detain a hostile fleet under fire, batteries can not be expected to prevent the entrance of an enemy.

*Second.*—East of Admiralty Inlet the coast line is considered by the Commission to run outside of Fidalgo Island; the latter being taken as part of the mainland, because the waters which separate it are not navigable.

There are good anchorages on this coast, with easy access to the sea as far as hydrographic conditions are concerned, though not as good as can be found elsewhere. The best position is in Bellingham Bay; but there the east shore, which alone offers good protection from prevailing winds, is already occupied by town sites, and the whole available waterfront will be required for commercial purposes if the sanguine expectations of the residents should be fulfilled. The country back of Bellingham Bay, and to the frontier, is level and singularly favorable to rapid military movements. Therefore while it may safely be assumed that permanent occupation by any probable enemy could not be maintained, it is possible that, to a navy-yard placed there, a sudden raid might result in injury irreparable for the time.

The most decisive argument, however, against the whole coast-line here under discussion, from Cape Flattery to the frontier, is that in its present state of development, it does not possess the importance which would justify a strong system of sea-coast defense; and therefore either a navy-yard placed there would be undefended, or an elaborate line of works, otherwise unnecessary, would have to be erected for its sole protection. The undeveloped condition of the country implies, as is actually the case, imperfect lines of communication with the interior, and deficient resources of the kind required by a navy-yard.

IV. *The San Juan Islands, or Haro Archipelago.*—The anchorages in this group of islands, and the character of the approaches to them, combine to present a strong attraction to the military seaman. It is conceivable that, if confronted with a fleet of substantially equal force in these and the adjoining waters, a strongly fortified naval station, or outpost, might be occupied here with great advantage. Griffin's Bay, with its high surrounding shores and its three narrow entrances (opening, one on the Straits of Fuca toward the sea, the others to the north and to the east, on the main ship-channel to the Gulf of Georgia and on Rosario Straits), is peculiarly fitted for such a station; controlling by its position all egress and ingress to the mainland by these approaches. Such a position on the fighting line, however, though well suited for storing supplies of coal, ammunition, and provisions, and as the station for ships in full fighting equipment, is not what is wanted for a navy-yard. The latter bears to the coast and ships dependent upon it the relation of an essential and permanent base of supplies. Upon its efficiency, and therefore upon its security as well as upon its accessibility, depends the successful maintenance of war. It can not

prudently or usefully be thrust to the front, to share and invite blow for which, if serious, it alone can provide a remedy. The ships lying along its front or in its docks should not be those which are ready for battle; but those which either are not yet prepared, or which have been turned crippled by service or in action, and need the unmolested labor of the yard to fit them again for their work.

If, instead of being in equal or superior force to an enemy in the waters, the United States should be inferior, a navy-yard in the Juan Islands, not being itself a fighting element, would not add to security of the islands, but would be cut off from communication with the mainland; without which its usefulness would last at best for a very limited time.

For these reasons the Commission did not make an exhaustive examination of the San Juan Islands, and does not recommend them as a site for a navy-yard. The selection or recommendation of positions for naval stations, for coal or other uses, does not enter into its instructions.

*V. Puget Sound.*—"Puget Sound" (see maps I and II) has now become by authority, the collective name for a large body of water, the different divisions of which have for the most part their own distinguishing titles. Originally the name Puget was confined to the subdivision lying above (that is, south of) the Narrows.

There are two entrances to Puget Sound from the Straits of Juan de Fuca, viz, through Admiralty Inlet, which is the usual and more important channel, and through Deception Pass, 17 miles further north between Whidbey and Fidalgo Islands. Of the latter it will be sufficient to say here that it is so narrow, the current so irregular, and except for very short intervals at slack water, so violent, and the necessity of clear vision so imperative from the natural difficulties, that the very smoke of an engagement would probably deter the boldest ships from risking its passage. It can be well commanded by batteries having both an enfilading and plunging fire upon approaching vessels. For naval attack it may be said there is but one entrance to Puget Sound.

Entering by this more usual passage, the main branch of the Sound extends south with a constant width of 3 miles. Sixty miles\* from the entrance, just within the city of Tacoma, the Sound contracts to a width of less than a mile, forming a passage 5 miles long, known as the "Narrows," which makes a marked natural division between the upper and lower sounds. Before reaching the Narrows, however, the main branch of the Sound throws off two large offshoots. The first in order, known as Hood's Canal, parts on the west side at Foulweather Bluff, 15 miles from the entrance, and trends south-southwest for a distance of 45 miles, after which it turns sharply to the east-northeast for 13 miles more, when its head is reached. The second offshoot, which is sub-named Possession Sound, Port Susan, Saratoga Passage, and Similk Bay, separates from the main branch on its east side 25 miles from the entrance. Its general direction is northerly, and being 35 miles long, it reaches 17 miles north of Admiralty Inlet, ending in Similk Bay, to which admission is also gained from the Straits of Juan de Fuca by Deception Pass, before spoken of.

Above the Narrows Puget Sound widens out over a large area, running through numerous channels around numerous islands, and forming several inlets spread out like the fingers of a hand or the

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\* Throughout this report "miles" mean statute, not nautical, miles.

spokes of a wheel, and known by various names: Carr's Inlet, Case's Inlet, Budd's Inlet, etc. As the tide in some of these, and notably at the head of the Sound, has an extreme rise of 18 to 21 feet, and an average rise of from 9 to 13, it will be conceived that when the excess of water in this great area seeks to ebb through the Narrows, or on the return of the tide has to flow, currents of unusual strength and, as experiment has shown, of some irregularity are developed. These currents have had and still have an important military bearing; but that bearing now is different from what it was formerly.

One of the inlets above the Narrows (Case's) extends to within 4 miles of the head of Hood's Canal. The land separating the two is said to be low, forming a portage; and it is thought by parties familiar with the ground that a canal could without difficulty be made joining the two bodies of water. This low narrow strip of land is the neck of what is termed the Great Peninsula, which has a length of 40 miles north and south, with a width varying from 25 miles at its base to 5 or less at the north end. This peninsula is embraced between the waters of Hood's Canal and of Puget Sound, above and below the Narrows.

On the east side of the Great Peninsula there is an extensive recess of the coast line, forming, with its ramifications, a water area of over 20 square miles. Immediately across the mouth of this great recess or bight lies Bainbridge Island, 10 miles long from north to south. The interposition of the island between the main sound and the recess in question converts the latter into a spacious harbor, known generally as Port Orchard (Map III), though its subdivisions have each their special names: Dye's Inlet (or Port Washington), Dog Fish Bay, etc. The anchorage ground throughout this harbor has good and not excessive depth; while the two entrances, north and south of Bainbridge Island, are passable by ships of all sizes and are easily defensible. The peculiarities of Port Orchard entitle it to be classed as a separate subdivision of Puget Sound.

A marked peculiarity and drawback to this great water area, whose leading outlines have so far been indicated, is the excessive depth found throughout the greater part of it. This is a twofold disadvantage: First, from the maritime point of view, in restricting the anchorage ground; and, secondly, from the military point of view, in that the great depth combined with the rapid currents make it impossible to employ any system of stationary torpedoes, as yet devised, to support the defenses of the entrance, or any part of the principal channels, up to and including the Narrows; for the latter also are of great depth and rapid current.

This defect of excessive depth is indeed remedied by the existence of various harbors, larger or smaller, known generally as "ports," as Port Madison, Port Gamble, Port Ludlow, etc.; but, unfortunately, it exists in its most aggravated form along the very coast, the eastern, which would naturally first be developed, and which may reasonably be expected to retain in the future a pre-eminent importance due to its greater nearness to the centers of the country and population. In fact, the two great cities of the Sound, Seattle and Tacoma, despite this disadvantage, are already established there. The moderateness of the weather and wind allows ships to lie alongside the wharves, which are thrust out upon the narrow ledge of shoal that fringes their water front; but all the "ports" or other anchorage ground are to be found either above the Narrows, or on the west side of the Sound, or on the Great Peninsula.

One other feature of the soundings needs to be mentioned. When

rivers or streams of any size enter the Sound, more or less extensive flats are formed, which are often bare at low water. This feature, most common on the eastern side. Dwamish Bay and Commencement Bay, the harbors, if they may be called such, of Seattle and Tacoma respectively, are instances. The flats at the heads of these bays off almost without intermediate soundings to depths of 150 to 250 feet. The city of Olympia, at the head of Budd's Inlet, is separated by over a mile of flat from water where vessels of moderate draught can float at low tide; but the anchorage beyond that distance is good, with reasonable depth. The most marked instances of these flats are in Possession Sound, Saratoga Passage, and Similk Bay; where the Skagit and other rivers empty. These are so extensive as to narrow to 1,000 yards the channel between Saratoga Passage and Similk Bay; a fact which, from the military point of view, renders the prohibition of all hostile entrance through Deception Pass doubly sure. Even if an enemy had overcome the difficulty of the almost impregnable pass, he would still have to run the gauntlet of this narrow channel, over 4 miles long, which, from moderate depth, can receive torpedoes throughout. Granting reasonable preparation, it may safely be said there is no entrance to the Sound save by Admiralty Inlet.

It has been thought best to enter into a detailed description of the leading features of this remarkable inland sea, because in the judgment of the members of the Commission it is clearly indicated as the water upon which, somewhere, should be placed the navy-yard, a site which they were directed to select. It alone, in all the great region under examination, combines with perfect accessibility to the largest ships, at all times, such a present development as demands that interests should be embraced in a scheme of sea-coast defense, beneath which the proposed yard would be established in safety, without the absolute necessity of fortifications of its own; and it is difficult to do that a sheet of water so favorably situated, with so vast a coast-line will become the future center and outlet of interests growing yearly in extent, and in importance to the whole country.

Accepting Puget Sound as the locality in which the yard should be placed, the question of the particular site will be approached by considering successively the several great subdivisions in the following order: (1) The Sound below (north of) the Narrows. (2) Hood's Canal. (3) Possession Sound, with Similk Bay and Port Susan. (4) The Sound above the Narrows. (5) Port Orchard.

(1) *The Sound below the Narrows.*—The Sound below the Narrows has a nearly constant width of 3 miles throughout its length from Admiralty Head to Point Defiance. It has no good and commodious harbors except the three grouping round the city of Port Townsend, viz: Port Townsend, Oak Bay, and Kilisnoo Harbor; Quartermaster's harbor in Vashon Island; and Gig Harbor. The three first have good anchorages, but the entrance to Kilisnoo is so shoal as to throw it out of consideration. Port Townsend has an excellent anchorage, and at the head of the bay there is good shelter from the worst winds, which blow from the southward and eastward, that is from up the Sound, and which are at times heavy enough to prevent vessels from lying at the city wharves.

It is the opinion of the Commission that, as the width of the Sound is nearly uniform from the entrance to the Narrows, and as the cities of Seattle and Tacoma, the most important on the Sound, are found in this division, the principal line of defense for Puget Sound will naturally,

be thrown as far forward as possible, namely, to the entrance; because such an advanced position will cover the greatest amount of ground in its rear, and because the relative positions and individual advantages of Admiralty Head, Point Wilson, and Marrowstone Point are peculiarly adapted to cover the entrance with a cross and plunging fire.

Assuming this position for the outer line of defenses, and none can be found farther forward, the Commission consider Port Townsend too far to the front; and that in case of the temporary naval superiority of an enemy in the Straits of Juan de Fuca, a yard situated there might be shelled from the straits without serious hinderance from the batteries.

The Commission also consider that, as the great depth of water at the entrance, 200 feet, forbids the successful use of stationary torpedoes or submarine mines, it would be possible for a hostile fleet, temporarily superior, to run the batteries and destroy the yard; and that, if the yard were at all worthy of its important purposes, the object of such an attempt would be well worth the risk.

The Commission also consider that the position of Port Discovery would offer a valuable means of approach to an enemy seeking to attack a navy-yard at Port Townsend by land and sea; and that the position is in so far a menace to Port Townsend, unless Port Discovery be protected by a system of fortifications, for which its importance otherwise does not call.

The Commission also consider that the resources and communications of Port Townsend, and generally of the country west of the Sound, are as yet too limited, and their future too uncertain, to justify the selection of this site for a navy-yard when such other objections as those before named already exist.

It is manifest, of course, that these disadvantages would have to be accepted if as good a site could not be found elsewhere; but the Commission are of the opinion that a better site can be had.

Quartermaster's Harbor, between Vashon and Maury Islands, is one of the very few good inclosed anchorages to be found below the Narrows. It was carefully examined by the Commission and two points were noted where the topography seemed fairly suitable. The position is entirely insular; and, as the neck joining the two islands is so low as to be nearly awash at low water, every part of the harbor is open to attack by ships in the Sound, either from the northward or southward. These two reasons mainly determined the rejection of Quartermaster's Harbor.

Gig Harbor, at the entrance of the Narrows, opposite Point Defiance, was also visited. The entrance is shoal and narrow, and the port at once too contracted and too exposed for serious consideration. The neck which so narrows the entrance is a sand spit, affording no cover.

As the important cities of Seattle and Tacoma are both upon this part of the Sound, this is the proper place to say why the Commission have not selected a site in or near these cities.

The principal reasons are the lack of anchorage ground, unfavorable topography in the neighborhood, and that these cities lie open to bombardment by any fleet which shall succeed in running the batteries above. No position can be found in their neighborhood which would not be open thus to a force which should, not subdue nor reduce, but simply run by the forts that may hereafter guard the channels.

The statement can still be accepted, as it has been for a hundred years, that a fleet can pass any batteries through an unobstructed channel, if its motive power be assured. The depth of the Sound below the Narrows is too great to admit of any obstructions yet known. Pro-



tection, therefore, must depend not upon fortifications alone, but also upon floating and movable structures, coast-defense ships, and torpedo vessels, which shall be rather the primary than auxiliary means of defense. These in turn depend for their efficiency upon the yard; which should, if possible, be so placed as to be out of risk of danger from a sudden attack, a temporary reverse, or superiority of the enemy due to backward preparations on our own part.

The Commission do not consider any place on Puget Sound below the Narrows a suitable site for a navy-yard.

(2) *Hood's Canal*.—There are positions on Hood's Canal which from depth of water and topographical surroundings are apparently fairly adapted for a navy-yard, but they are not intrinsically as good as positions that can be found elsewhere. The whole of this region lying on the west side of Puget Sound is as yet little opened, and it is remote from the present, and probable future, chief centers of activity and communication.

(3) *Possession Sound, with Saratoga Passage, Similk Bay, and Port Susan*.—With the exception of Similk Bay the hydrography and topography of these waters is such as to offer no sites for a navy-yard at all comparable to those that may be found elsewhere. The shores are bold and precipitous, with deep water close to. Upon Similk Bay there is a limited area of ground of gentle slope with moderate water in its front. The position is one susceptible of strong local defense against naval attack, being approachable only through Deception Pass and the narrow channel before alluded to, which connects Saratoga Passage with Similk Bay. Neither the topographic nor hydrographic conditions, however, are at all equal to those of the site which the Commission finally selected, nor are the facilities for local defense superior, if they be as good. The anchorage ground is contracted and of uneven depth. This bay, between Hope Island and Deception Pass, is considerably farther from the entrance to Admiralty Inlet by interior line than the site chosen by the Commission, which would be a disadvantage to the coast-defense vessels stationed at that entrance. Finally, this position is in a country as yet undeveloped and without railroad communications; it is remote from the present centers of commercial activity and labor on Puget Sound.

Speedy access through Deception Pass to the Straits of Fuca and the approaches to the Gulf of Georgia is the only plausible argument in favor of this position. A navy-yard on the spot, however, is not necessary; will not even improve this advantage. Even under friendly guns Deception Pass will be an awkward and dangerous channel for heavy and costly ships. It, and the harbor behind it, can properly serve only for vessels of the cruiser class, not for fleets. In short, Similk Bay is fitted not so much for a navy-yard as for a naval station and depot of supplies, close to the front of operations, like the San Juan Islands. It is inferior to the latter in natural advantages, particularly in having but one exit on the scene of activity; but with reference to maintaining the supplies that might be centered there, it is superior in possessing an interior line of communications, not liable to interruption by an enemy.

(4) *The Sound above the Narrows*.—In the Sound above the Narrows the depth of water is for the most part considerably less than in the lower Sound.

In the extensive length of the coast-line, due to the numerous inlets and islands found within the Narrows, there occur several places whose topography and hydrography seem to offer a suitable site for a navy-yard; and among these doubtless some would be found to stand the test of a closer scrutiny than that the Commission thought necessary to give.

It has also been urged upon the Commission that the distance of the upper waters of the Sound from its entrance at Admiralty Head would contribute to the security of a yard against an enemy, while the Narrows form a natural and formidable line of defense.

The Commission consider, however, that a navy-yard may be too far from the front as well as too near it; and particularly when, as in these waters, the sea-coast defenses must largely depend upon coast-defense ships of various kinds. In case of injuries, requiring perhaps but a short time to repair, these ships should not be compelled to go from 90 to 100 miles to a yard, when an equally good situation for it can be found at half the distance.

As regards the Narrows, considered as a line of defense, the necessity of passing within close range of the batteries on either shore would doubtless weigh heavily in the councils of an enemy; while the heights of the bluffs on both sides insure a plunging fire, which could be made of a most formidable character.

Nevertheless, the considerations that favor the passage of a fleet before batteries, without vital or decisive injury, remain in force; lessened, perhaps, by the characteristics of this particular passage, but by no means destroyed. The shortness of the time under fire, the security of the motive power, and the speed insured to modern steam ships-of-war, the difficulty of hitting a target that moves so rapidly across the line of fire, the smoke of battle, and finally, the opportunities offered by night and fog, if the way be straight and clear as the Narrows, all concur to assure the practical immunity of a fleet passing batteries in an unobstructed channel. The Narrows can not, under any present or as yet probable system, be obstructed by stationary torpedoes or submarine mines; the depth being from 120 to 250 feet, and the speed of the current above 4 nautical miles, probably at least 5 statute miles per hour. It must be remembered that the time of attack is at the choice of an assailant, and that the speed of the current can be taken in favor of the speed of his passing. There are here no pilotage difficulties to embarrass him.

The Commission do not consider the Narrows susceptible of being securely held against an enemy of the present day. Owing to the uncertainty and usual gentleness of the wind in Puget Sound they were a formidable obstacle to sailing ships, which could rarely count on a "commanding" breeze to make them manageable in the violent and irregular currents. Their motive power was exposed to destruction, and they themselves to being thrown by the tide athwart the passage, the position most dangerous to them.

Further, it will be remembered that both Tacoma and Seattle, the two chief cities, lie below, outside the Narrows. The Commission can not anticipate the decision of the Chief of Engineers; but it seems probable that this fact will determine the principal line of defenses to be below those cities, and, as has before been said, at the entrance. There are not now within the Narrows any interests sufficiently great to claim defenses for themselves alone. Consequently, any works placed there for the security of the yard would be constructed for that purpose only, and the Commission believes that the site it will present is ca-

pable of far more efficient local defense by guns and torpedoes than the Narrows will admit.

There remains another drawback to the Sound above the Narrows in the great rise and fall of the tide. In Olympia, at its head, the difference between extreme high and extreme low water is over 20 (20.7) feet, while high-water springs rise 18 (18.4) feet. Wharves being built so as to be a little clear of the high-water line, the inconvenience to ships lying alongside them with these varying levels can be recognized, as well as the greater height and consequently greater expense entailed in building them. Like other difficulties, this can be met when necessary, but should be avoided if possible. Below the Narrows the variations are much less. In the site to be presented the extreme difference is under 15 (14.6) feet, and high-water springs rise 13 (12.9) feet.

It remains to be said that the development and resources of the country within the Narrows are as yet inferior to the eastern shore of the lower Sound, and seem likely so to continue.

For the reasons given the Commission, having found a site it thought better situated for local defense, if such were desired; better situated with reference to the naval necessities of the whole water area; freer from particular objections to which the Sound above the Narrows is open, and better situated with regard to centers of labor and supply, did not proceed to a closer examination of the various localities noted by it, in its preliminary reconnaissance of this subdivision.

(5) *Port Orchard.*—The Commission having been led, by a process of comparison and elimination, to the conclusion that Puget Sound is the best locality for a navy-yard in the entire region it was directed to examine, have, through a similar process applied to the Sound itself, reached the opinion that Port Orchard possesses advantages over all its other divisions, and that the particular site should be sought behind Bainbridge Island.

The chief and only substantial drawback to this position will first be stated. It lies on the surface, as do also the reasons why, in the judgment of the Commission, the drawbacks must be accepted. Port Orchard is on the west side of the lower Sound, separated by water from the cities of Seattle and Tacoma, which are now, and seem likely to continue, the chief centers of commercial and manufacturing activity on Puget Sound. Its advantages in other respects are so great that scarcely any hesitation or argument would be needed, before fixing upon it, were it upon the eastern instead of the western shore.

A cursory inspection of the charts will be sufficient to show the absence of good harbors and the openness to attack of all the east shores of the Sound, and the Commission has satisfied itself that they do not offer a favorable topography.

A great navy-yard has a twofold aspect. It is on the one hand a business establishment for carrying on certain work of a very special kind. On the other hand it is, for the coast and fleet dependent upon it, a base of operations in the most vital sense of the word; and nowhere more so than in Puget Sound, where the defense of the water and its cities will rest mainly upon the armed shipping, and so ultimately upon the efficiency and security of the yard.

The latter character, though obtaining only in time of war, is the more important. The tendency of a business establishment to place itself near the materials, labor, and sources of power which it uses—near its resources—must, therefore, in this case, be checked by a consideration of the military exigencies; and, if the two requirements can

not be perfectly reconciled, the military necessity must override the convenience of business.

Allowing, for the moment only, that the business advantages are *all* in favor of the east side of the Sound, it must also be admitted as possible that hostile ships might pass any and all stationary defenses, including the Narrows. Having effected such a passage, through the absence or the misfortunes of our armed shipping, their guns will command the shore-line in question with its cities, unless the latter be adequately protected by batteries in their immediate neighborhood; a condition difficult of fulfillment and not likely to be met. A navy-yard close to them would both be exposed to and invite an attack, which considerations of humanity might otherwise avert. Puget Sound is not among those waters of which it can be affirmed that the art of the engineer has solved the problem of absolutely excluding the entrance of an armed fleet.

Port Orchard, on the contrary, admits the application to the utmost extent, and in the least expensive manner, of all the resources of the engineer. It is the citadel of Puget Sound, not to be reduced except by long and regular approaches, even if the outer defenses be forced and the rest of the Sound in the hands of an enemy. Suitably defended, it is safe both from a sudden dash and from distant bombardment by shipping. Within its ample limits not only the navy-yard but all the merchant shipping of the Sound can find a secure retreat; while with two natural outlets, 10 miles apart and of ample depth, the ships of war can not be shut up as they might by the injury of an artificial channel, but remain a constant threat to an enemy outside and a hindrance to any extensive operations farther up the Sound.

But while the military reasons for selecting this locality are so strong, the assumption, admitted for the moment, that the business considerations are *all* in favor of the other side is not correct. In its business capacity a navy-yard needs not only to be near centers of supply and labor, and in easy communication with them; it requires also good anchorage off it, water deep but not too deep, ample water frontage, and a sufficient acreage of ground of slight elevation above high-water mark, either level or of a light grade, to admit of the easy transportation of heavy masses and the inexpensive excavation of dry docks. If in the former conditions Port Orchard is somewhat inferior to the neighborhood of the Sound cities, it is greatly and decisively superior in the fulfillment which it presents of the latter group of requirements; while in the character of the ground for supporting heavy buildings, in the healthfulness of the climate, and in the supply of good drinking water, the two localities are equally favored.

In regard to the position as somewhat removed from centers of supply, the Commission have not been disposed to attach much weight to the necessity of trans-shipment, by water, of supplies brought to the cities by rail. It is admitted to be an inconvenience, but not more. Port Orchard is distant by water from Seattle between 10 and 15 miles, from Tacoma double the distance. Except this inconvenience, the resources in the way of supply of the rest of the Sound and of the whole Northwest are equally the resources of Port Orchard. It may be added, although the Commission has as a rule avoided surmises on the future and confined itself to present conditions, that there is good reason to expect railroad communications before very long. A road has already been built from the head of Hood's Canal toward Port Orchard, which, although for logging only, is incorporated; the distance is only 10 miles, the ground is reported as of easy grade, and this road would readily

communicate with others already projected. The question is important rather from the military point of view than from that of convenience, as affording a second line of communication less open to interruption than that by water. (See letter from R. R. Co., Appendix B.)

The distance from centers of labor seems of more consequence. The intermittent activity which characterizes our navy-yards, the taking on and discharging of men according to the state of the appropriation, the necessity for increasing the force largely on emergency, make it an undoubted inconvenience to have a yard distant from the ordinary abodes of the required labor. The inducements afforded by navy-yards under present conditions, and especially under the eight-hour law, may probably be relied on to meet this difficulty, which reduces itself mainly to the question of providing lodging and food on the spot for a considerable temporary increase of the working force. This difficulty is minimized by the abundance and cheapness of lumber and the conditions of the climate, which is so moderate as to admit of men living comfortably and healthfully in the merest shells. A village named Sidney is already established a mile from the site selected by the Commission.

The chief, and in the opinion of the Commission only, defect of Port Orchard having now been stated and sufficiently discussed, the reasons which dictated the selection of the particular site within the port will be first given, after which the advantages of that site itself will be presented in full detail.

Four positions were noted in the preliminary but very careful reconnaissance made by the Commission:

- (1) A peninsula on the west side of Bainbridge Island.
- (2) The north side of Dog Fish Bay.
- (3) The west side of Point Glover, just within the entrance by Rich's Passage.
- (4) Point Turner, at the entrance of Dye's Inlet, which was the final choice of the Commission.

These four positions are marked with their respective numbers on the appended chart of Port Orchard. (Map III.)

Dye's Inlet, known locally as Port Washington, received also the careful examination of the Commission. There is more than one possible site within it or on the narrow passage leading to it; but the current in the passage is rapid, the depth not always sufficient for the heaviest ships, and the positions within more open to shelling from Hood's Canal than Point Turner is from the lower Sound. It is not desirable that the yard should need special protection against water attack from the westward.

(1) The peninsula on Bainbridge Island offered excellent topographical indications, with an ample water front so disposed that the buildings and shops of a yard would be centrally placed relatively to the whole line. The anchorage before it is good and roomy. The deep bight to the northward promised a good ordinary for ships laid up, while that on the south presents an excavation already begun for a dry-dock.

This position was rejected mainly because on an island, the Commission being unwilling to cut the yard off from any probable direct communication with the railroad system of the future. It was also considered to be too near the lower Sound; its defense would necessitate more extensive preparations at the north end of the island than would be required merely to close Agate Passage to the entrance of a fleet.

- (2) The topographical indications on Dog-Fish Bay were excellent, presenting quite an extent of level ground, with ample water front. The anchorage is somewhat contracted. Being on the main-land of the Great Peninsula, this position is not cut off from the future railroads.

Like the first, this position is too near Port Madison and the open waters at the north end of Bainbridge Island. The Agate Passage can be so easily closed to an enemy, as compared with the southern entrance, as to dictate the accumulation of works for local defense about the latter. A yard placed at the northern end of Port Orchard would demand defenses for the special purpose of keeping hostile ships at a safe distance; which works, but for the yard, would not be necessary.

- (3) The position within Point Glover offered fair topography and water-front. The soundings immediately before it are very deep for Port Orchard, and inconveniently so for ships at a yard. This site is also closer than is desirable to the main entrance, Rich's Passage, and the presumed fortifications covering it; and finally, it is at least 3 miles nearer than Point Turner to the position at which it may be hoped hostile ships can be kept, by suitably disposed local defenses.

- (4) The considerations thus briefly given determined the Commission to examine Point Turner first among the sites favorably noted in the preliminary reconnaissance; and, if the local features proved satisfactory, to give it the final preference.

This part of Puget Sound having within the past few years been very closely and carefully surveyed by the officers of the U. S. Coast Survey, the hydrography was accurately known already by charts, which, though not yet published, were in the hands of the Commission; a copy from which accompanies the report. It will be observed that the depth, outside the 5-fathom line, is in Sinclair Inlet quite uniform; between 6 and 8 fathoms (36 and 48 feet). In the channel leading to Dye's Inlet (locally styled Port Washington Narrows) there is about the same depth; diminishing, however, in places to less than 5 fathoms, a fact which weighed with the Commission in rejecting the inlet.

The belt in Sinclair Inlet, between low-water mark and the depth of 30 feet (5-fathom line) at the same stage of the tide, which marks the probable line of the water-front and docks, averages about 250 yards in width. This is not excessive, and, when filled in, the ground thus reclaimed will be an important addition to the yard. There is more than enough of hilly ground immediately behind to fill in this space. The water in Dye's Inlet Narrows is deep close to shore.

The current through the Dye's Inlet Narrows is rapid, but not so in Sinclair Inlet.

The average rise and fall of the tide is between 8 and 9 feet.

Finally, the hydrographic conditions are satisfactory in that Point Turner is accessible to the heaviest ships at all times through Rich's Passage; and also, except at low water, through Agate Passage.

In the matter of topography and the character of the ground the information of the Commission was much less definite; and, there being but little cleared ground on the point, a closer examination became necessary. Owing to the dense growth of thicket and underbrush, with fallen timber, this was a proceeding that required both time and trouble. The Commission was able to satisfy itself that there was enough ground either level or of slight incline for the purposes of a yard; that a great part of the general surface could be easily and inexpensively graded; and that when this was done the area included in the selected site would readily lend itself to a convenient arrangement of docks, dry-

docks, workshops, offices, and quarters of every kind, including, if necessary, marine barracks and hospital. But while the Commission on the spot was able by personal examination thus to satisfy itself, it was impossible so to describe the area as to be intelligible to a person called upon to pass comment or take action; and as the act constituting the Commission required a detailed report, and that the Secretary of the Navy should transmit the report with his comments to Congress, it was felt necessary to obtain such a survey as would show graphically and precisely the character of the surface and lay of the ground. Through the kindness of the Superintendent of the Coast Survey the services of Assistant J. F. Pratt, an accomplished surveyor, were placed at the disposal of the Commission, and a copy of the survey made by him is appended to the report. (See Map V.) This survey shows with great precision the contours of the shore, as well as the hydrography, along Sinclair Inlet, which would naturally be the principal working front of the yard. The funds at the disposal of the Commission were not large enough to admit of an equally minute examination of the rest of the ground.

From the report of Mr. Pratt, accompanying his survey (Appendix C), the following details are summarized:

The site, within the limits recommended, contains 1,752.2 acres. Of these there are, close upon and tributary to the Sinclair Inlet front, about 392 acres which are now of practicable slope, merely correcting irregularities. This amount can be increased to over 500 acres without heavy expenditure for grading. By filling in to the 5-fathom line at low water, about 164.5 acres more will be redeemed. The earth for such filling in exists in more than sufficient amount in the high ground of the site close to the water.

The site will afford a mile and a half of water-front on Sinclair Inlet, and on the whole shore-line can give between 6 and 7 miles; while the anchorage ground directly in front of it, in less than 10 fathoms and more than 4, is  $1\frac{1}{2}$  square miles.

There are upon Sinclair Inlet, within the limits of the site, two low basins, the beds of very small streams, named provisionally Jertsen and Williams basins, both of which will be available for the excavation of dry-docks. The former is 1,800 feet wide and extends back with that width three-quarters of a mile from shore. In Williams basin the front is 1,400 feet wide and extends back about the same distance (1,400 feet), contracting to a point.

It may be added that on Dye's Inlet Narrows there is a deep bight within the site, well adapted for ships laid up in ordinary.

The limited amount of money at the disposal of the Commission prevented it from having as many borings made as it would have wished. Six were ordered, as the most the appropriation would stand; but three only could be made owing to the character of the ground. The results of these are given in detail in Mr. Pratt's letter (Appendix C). In one case sand of considerable depth was struck, but this is probably a contracted local condition. In the other two the results justify the anticipation of the Commission, based upon an examination of the bluffs, that the soil would be found suitable for foundations and for excavations. It may be added that the characteristics of the ground in the site selected are those of the Puget Sound region generally.

The Commission closes this detailed description of the site selected by a summary of the conditions as found, corresponding to the require-

ments laid down by the Navy Department's letter of November 30, 1888 (page 6).

(1) The situation is upon a good harbor, with ample extent and depth of water for ships of the largest size and heaviest draught, and is accessible to them at all times.

(2) The principal lines of defense have not yet been laid down, but the opinion given by the Commission as to their probable location coincides with the conclusions of the Chief of Engineers, U. S. Army, in his letter of April 27, 1888 (Fiftieth Congress, Senate Executive Document No. 165). The site chosen is well within any probable line of defense intended to cover the principal cities of Puget Sound. It may be added that it is also favorably situated to support that line of defense, while itself remaining secure.

(3) Its position and natural surroundings are such as to afford ample local security from attack by naval force, whether by dash or bombardment, with unusually small expense in preparation of defenses. The northern entrance, Agate Passage, is exceedingly narrow and, while possessing sufficient depth for the heaviest ships at quarter-flood, can be filled with submarine mines. In this direction 11 miles is the shortest distance to which an enemy can approach the yard. The southern entrance, Rich's Passage, makes at Point Glover a sharp bend of 110 degrees in its course from the Sound to Port Orchard. Its shores are lined by bluffs which, though often of moderate elevation, give both enfilading and plunging fire upon a passing vessel, and which extend over so long a line as to admit of guns being massed or dispersed, as may seem most advisable. This passage is 3 miles long and nowhere wider, from shore to shore, than 1,500 yards. At the throat, for a mile, it contracts to 700 yards, and the water throughout, though deeper than desirable with the current, will admit of torpedo defenses. Two miles outside of Rich's Passage, in the Sound and almost mathematically in the center of the deep bight between Bainbridge and Vashon Islands, lies Blake Island, over 200 feet high and with slopes favorable to fortifications \* (see Maps II and III), which possesses all the advantages of an advanced post without the weaknesses of a salient; both flanks and rear being covered by the coast line, generally high, extending from Restoration Point by Point Orchard to Vashon Island, and nowhere more than 2 miles distant from Blake Island. Such conditions make it impossible for a fleet to surround the latter with a converging fire. By occupying the line indicated, and assuming that a fleet intent upon bombarding an unscendistant object—a task which demands great precision and some immunity from molestation—will not lie nearer than 2 miles to batteries with plunging fire, the yard is found to be over 8 miles distant from a possible enemy. If an attempt at bombardment be made from lower down Admiralty Inlet, to the east of Bainbridge Island, the heights there are equally favorable to defense; and even if unoccupied, the nearest approach there to Point Turner is 7 miles, with very high ground intervening. More favorable conditions of position and natural surroundings against naval attack, under the supposition of the principal line of defense to Puget Sound being forced, can rarely be found.

(4) The water-front on Sinclair Harbor is a mile and a half long, which, after all deductions for dry-docks, building slips, etc., will allow at least a dozen of the heaviest ships known to lie at the docks in a single tier. The Commission consider that the water front on the entrance to Dye's Inlet (Port Washington Narrows) can be used for

\* A letter from Mr. Pratt giving the results of a reconnaissance of Blake Island will be found in the appendix. (Appendix D.)



lighter vessels, if more space is needed. The current, though strong, will not prevent this. The two fronts together give a water-front of 6½ miles.

(5) The position with respect to lines of interior communication has been already incidentally, but fully, discussed. It is not as good as could be desired, but the defect amounts at worst to a present inconvenience. The site is on the main-land and can be connected with the railroad systems. By water, it is in easy communication with all the resources of the country.

(6) From want of money it has not been possible to make an exhaustive examination of the site with reference to its fitness for supporting heavy structures and for excavations. It has the general external characteristics of the Puget Sound country, the surface indications are favorable, and the borings are thought to promise satisfactory results. The Commission believe that the ground will be found suitable for the purposes named.

(7) The site is 15 miles from Seattle, 30 from Tacoma, the principal centers of labor and supplies upon Puget Sound. Both labor and supplies can be obtained from those cities.

(8) The climate is the same as that of Puget Sound generally. There is a large amount of rain-fall throughout this region, though much more in some places than in others, and the same remark is true of the Columbia; but a distinguishing feature of the climate as compared with the Atlantic coast is the small range of temperature, and consequent freedom from extremes of either heat or cold. All accounts agree in the natural healthfulness of the region generally, and that out-door labor can be carried on throughout the year with the loss of very few days.

(9) The few and scattered settlers now on Point Turner obtain water from wells or small springs. There is little doubt that wells would supply all the wants of a yard; but to set at rest even that small doubt, the Commission examined Lake Kitsap, (see Map IV), 3 miles from the proposed site. The lake was found by two barometrical observations to be 129 and 145 feet above high water; mean, 137 feet. A specimen of the water was taken, and pronounced to be wholesome and potable by one of the leading physicians of Seattle. From an examination of the outlet a rough estimate was reached that 337,000 gallons of water hourly passed from the lake. This result was purposely based on the lowest estimates of depth and velocity of the stream. The lake is a mile long by a third of a mile wide. Soundings were taken at the head and midway the length, in both cases near the axis of the lake; 9 feet were found at the former place and 27 at the latter. A settler on the shore stated that in the dry season the lake fell about 6 inches.

The Commission consider it certain that with Lake Kitsap in reserve there can always be had a sufficient supply of drinking-water. With a view to facilitate the use of the water of the lake by the Government, the Commission submit the convenience of obtaining a lot (No. 6, section 17) bordering upon it; which was valued and appraised in the same way as the lots constituting the site selected, the results being in the table appended. Throughout the Great Peninsula, south and west of Point Turner, the map shows numerous streams and ponds.

The Commission will add that the general surface of the country in the Puget Sound region reflects the depth, abruptness, and irregularity of the soundings. In a personal examination which extended over nearly five weeks, during which the whole shore was passed in review, there was opportunity to observe the generally broken character of the ground. Places presenting an approach to the level surface desired for a

navy-yard, and of sufficient extent, were relatively very rare. The Commission had, therefore, no hesitation in accepting a certain amount of high land, provided the necessary level, or practicable, ground conveniently disposed was found associated with it. The same natural conditions compelled the Commission to recommend the obtaining of an unusually large area, in order to make sure of the necessary space; but the size of this area and the central location of the higher ground will permit the disposal of the various accessories of a naval yard and stations, such as marine barracks, hospital, officers' quarters, etc., in a manner convenient, compact and yet not contracted, to a degree that is rarely realized elsewhere.

**VI. Lake Washington.**—West of the city of Seattle and 2 miles distant from it, but separated by very high ground, lies the large body of fresh water known as Lake Washington.

This lake is 18 miles long, with a width of  $1\frac{1}{2}$  to 3 miles. Its axis is nearly due north and south, and the greatest width is toward its natural outlet at the southern end. Mercer's Island, nearly 5 miles long, lies in the southern third of the length, and, being almost a mile wide, leaves a channel of the same width surrounding it, on either side and at the foot of the lake.

The west shore of the lake is parallel to the general direction of the adjacent Sound, at a fairly constant distance of 6 miles, the approach at Seattle being due to the deep bight called Dwamish Bay, at the head of which Seattle is built.

The natural outlet of Lake Washington is at the south end, by Black and Dwamish Rivers, into Dwamish Bay; but immediately north of Seattle, distant from the lake only half a mile, is a smaller body of fresh water of considerable depth, known as Lake Union. The latter has its own outlet, called Shilshole Creek, into Puget Sound. The project is mooted of forming an artificial channel, deep enough and wide enough for the largest ships, from Lake Washington to the Sound, utilizing Lake Union and the bed of its outlet. A water-way sufficient to float large logs or very small boats has already been cut between the two lakes. The mean water-levels above Puget Sound at high water are, Lake Washington, 20 feet; Lake Union, 12 feet; and as the fall of the tide in Shilshole Bay is from 10 to 11 feet, the difference of level between the two ends of the canal will be somewhat more than 30 feet. The length of the artificial channel thus to be made, including dredging in Lakes Union and Washington, is probably not less than 6 miles. Granting the canal made as projected, the peculiar advantages claimed for Lake Washington depend upon the fresh water and the difficulty of access by an enemy.

The Commission believe that such a canal can be built, the only questions being those of cost and expediency, on neither of which did it feel called to express, or form, an opinion. The project of converting this large sheet of water, by a canal magnificent in depth and proportions, into a land-locked harbor of extraordinary dimensions, lined by the wharves and surrounded by the din and activities of a great commercial mart, is fascinating to the imagination. The question of cost and general expediency belongs to others to decide. The Commission had only to determine whether it was desirable to build such a canal in order to have a navy-yard on the lake, and also whether, if the canal were actually built, the lake would offer the best site for the yard. Despite many arguments in favor, the Commission is of the opinion that, were

any probable canal already in existence, Lake Washington would be the best site for a yard.

The chief advantages claimed for the lake are, as already stated :

(1) Fresh water, involving the absence of the teredo, with its effect upon submerged timber in vessels or wharves, and the prevention of fouling or corrosion of the bottoms of iron ships.

(2) Immunity from attack, owing to the distance of the lake from the Sound and the contracted, and therefore easily defended, channel by which it must be reached.

To these should be added that—

(3) Being on the east shore of the Sound, it is convenient to the various railroad systems now existing, and to the resources of the whole country.

The Commission admit these advantages, and further, after sufficient examination, think a suitable site can be found on the lake; but it is of the opinion—

(1) That the water-front at the site selected can be of masonry, which will obviate the difficulty from the teredo; and as regards the fouling of iron bottoms in salt water, that, as salt water is necessarily the home and scene of action of ships of war, it is more important to secure access to it by channels which can not be interrupted than to have a navy-yard on fresh water. Ships need to be at a yard only when preparing for service; they can be docked, cleaned, and painted the thing before sailing; and when simply laid up in ordinary they can, if the proposed canal ever be built, be placed in the lake, either at anchor or at wharves, without the navy-yard being there.

(2) Immunity from attack. As regards bombardment, the point of the lake which the Commission thought most promising as a site (which is marked 5 on the maps) is as far as Point Turner from any position that an enemy's fleet can occupy, except in Dwamish Bay; and from there the high ground on which Seattle is built would probably prevent any shelling by guns of low trajectory. Access by an enemy's ships to the lake could of course be stopped, in the last extremity, by injuring the canal.

(3) The convenience of having the yard on the east shore of Puget Sound has already been admitted.

The Commission might urge that the first article of its instructions from the Navy Department (see page 6), of the importance of which it is fully convinced, would rule out any position not accessible to ships of the heaviest draught, except at the cost of a preliminary work of great expense and magnitude, requiring a long time to complete, and, so far as the Commission's knowledge goes, of uncertain result. It prefers, however, to rest its rejection of Lake Washington upon the grounds already stated, viz: That the navy-yard will be the base of all naval operations upon this coast; that the defense of Puget Sound must be largely, if not mainly, by naval means; and that therefore it will not do to put the yard in a place where, though perhaps safe enough, it will be dependent for access to the sea upon an artificial channel, which may become useless through treachery, through the sudden raid of an enemy, or through the necessity imposed upon us of destroying it ourselves from the unprepared condition of its defenses. It may be added that, granting the presence of a hostile fleet not superior to our own before the mouth of the canal, it will be no slight matter to get out and deploy a number of ships, through so narrow a pass, under an enemy's fire.

Supposing, on the other hand, the perfectly possible case that the outer line of defense has been forced, the coast-defense ships and other

naval components of the line worsted and forced to fall back. The enemy in pursuit can meet no position as strong as that which they have, by the supposition, already overcome. Arriving at Shilshole Bay the retreating ships, if as closely pursued as they ought to be, must, one by one, be successively received within this narrow entrance. There is no need to overdraw the embarrassment of a force so situated. If the enemy be able and active the result will be close upon destruction. If the attempt to enter be abandoned, the shipping, wherever else it takes refuge, will be separated from a base essential to its maintenance in good repair.

This difficulty could perhaps be met by the construction of an artificial port at the mouth of the canal, which could be strongly defended from its walls and the bluffs on either side. Such a work, however, would be an enormous undertaking. As elsewhere on Puget Sound the flats of Shilshole Bay, which are bare at low water, drop off at once to a great depth. The soundings show from 120 to 150 feet close to the flat. The port must therefore be thrust out into this deep water, or else the flat must be excavated to the depth of over 30 feet within the walls built upon it. The flat is, moreover, exceedingly narrow.

If the entrance to Puget Sound could be made impregnable these conclusions might be much modified, and especially if the commercial necessities of the Sound, which the Commission have been directed by the act of Congress to consider, required this additional water space. The demand for it, however, comes mainly from Seattle; and it appears to the Commission that, since ships lie quietly at the wharves, as has before been mentioned, there is no present commercial necessity for connection with the lake, while the amount of flat still unredeemed for wharf-room promises ample accommodation for a long time to come.

As regards the military question, the Commission does not think that Puget Sound can be made impregnable except by the presence of a naval force equal to that brought against it. Such a force, when combined with suitable permanent defenses, would be superior to the equal enemy supposed. When the hour of contest approaches, the mobile defenses would concentrate near the fortifications—probably in Port Townsend Bay. If powerful enough to hold their own, all will be well; but if, through some of the chances which must always be allowed for in war, or through original inferiority, the defending naval force becomes decidedly weaker than the assailant, the principal line of defense may be forced. In that case the defense ships must fall back; and it could not but be a matter of grave concern that they should then depend, for their efficiency and for their freedom of access to the scene of action, upon such a frail communication as an artificial water-way of the dimensions that may here be expected.

After duly weighing all the considerations that have been set forth above, the Commission has selected Point Turner as the site to be recommended to the Department for the establishment of a navy-yard on the northwest coast. The lines marking the limits of the area recommended are indicated on the accompanying map of Kitsap County (Map IV), and also on the survey made by direction of the Commission (Map V).

That portion of the Congressional instructions which required the Commission, after selecting a site for a navy-yard, "if upon private lands to estimate its value and ascertain the price for which it can be purchased," was executed with much difficulty.

The speculation in land in this section of the country is probably at its ripest stage, and followers engaged in this business were ready to

pounce upon any bargains that might be secured, and use the object of the Commission for speculative purposes. In order to avoid this effort it was decided to consider this question while the preliminary examination was in progress. As many of the owners as possible were seen, a written proposition obtained from them to sell their land to the Government within one year from date, for a specified sum. In some instances, where the owners could not be found until after public attention had been drawn to the investigations being made, prices were demanded to exorbitant figures, or else parties declined to set any value upon their property. These instances are noted in the tabulated statement appended and marked E.

In order to assist the Commission to arrive at a fair valuation of land in question, in a district where values were so fluctuating, it was decided to call upon persons who were more familiar with this subject than the Commissioners could be. Mr. A. H. Sroufe, of Sidney, W. T., was selected on the part of the Commissioners to act as one of three for this purpose, while the United States district attorney, Judge W. H. White, of Seattle, was requested to name a second. His nominee, W. H. Whitworth, of Seattle, and Mr. Sroufe, together, selected Douglas A. Allmond, also of Seattle, completing the organization required.

The three appraisers thus appointed made a careful inspection of the proposed site, and their report in the main has been used as the basis for the data herein given.

In order that the subject of ownership might be officially determined a description of the land was submitted to the auditor for Kitsap County, W. T., in which the recommended site is situated, who gave an abstract of titles as far as ownership had been established to date.

In a number of cases claimants had not completed the requirements to secure a title, and a transcript of the records of the United States land office at Seattle was obtained covering these cases.

Some of the claims had been filed so recently that no clue could be found to the parties holding them, and in one or two instances it is believed the parties will not return to perfect their claims.

From such claimants as could be found written statements were secured, wherein they proposed to relinquish their rights for a stated sum, provided they could relocate elsewhere upon public lands. If, therefore, the valuations given in this report are made the basis of the transfer of this land to the United States, it will be necessary for the Government to authorize this change of claims.

It will be noticed that the owners' valuation varies, not in accordance with the location and condition of the land itself, but with the date of agreement.

The appraisement is believed to give a fair compensation for the owners in case the Government should accept the property within the year ending March 31, 1890. These values include the improvements and prospective improvements to the date above given. The appraised estimate for the entire site recommended, comprising 1,810 acres, is \$33,129; the owners' valuation for the same aggregating \$37,964. One lot of 59.75 acres included in the above is situated on Lake Kitsap; in order, as before stated, to facilitate the use of the waters of the lake by the Government, if desired.\*

The Commission desires to acknowledge its obligations to the Light-House Board for the use of the tender *Manzanita*, without which its

\* The contents of the site proper amount therefore to 1,750.25 acres. According to the Government land survey, Mr. Pratt's corrected estimate of the same is 1,752.2 acres.

work could scarcely have been done so thoroughly, and certainly not so soon; and very especially to Lieutenant Uriel Sebree, United States Navy, the light-house inspector, whose cordial co-operation removed every obstacle that might otherwise have been encountered.

Its thanks are also due to the authorities of the U. S. Coast and Geodetic Survey for the ready and most valuable assistance extended by them. The Commission had occasion to use the local knowledge of Lieutenant Mayo, United States Navy, acquired while surveying the Sound; while the experience of Assistant J. F. Pratt was of great value in making the examination of the topography of the site selected, as well as in other ways. The survey of the site which accompanies the report is wholly the work of the latter. The skill and services of both these gentlemen are heartily acknowledged.

Very respectfully, etc., your obedient servants,

A. T. MAHAN,  
*Captain U. S. Navy.*

C. M. CHESTER,  
*Commander U. S. Navy.*

C. H. STOCKTON,  
*Lt. Commander U. S. Navy.*

## APPENDICES.

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### APPENDIX A.

#### *INFORMATION DESIRED BY THE COMMISSION APPOINTED TO SELECT A NAVY YARD SITE UPON THE NORTHWEST COAST.*

- (1) From what sources, in what quantities, and at what prices can timber for ship-building purposes be obtained?
- (2) Can lumber be obtained for wharves, etc., that is not subject to the attacks of the teredo?
- (3) What are the sources for supplying cast and wrought iron and steel? What quantities can these sources supply, and at what price?
- (4) From what points can coal be obtained, at what price, and in what quantities, by day or month, and what quality for steaming and manufacturing purposes?
- (5) Is there any limestone in the vicinity? If not, from what points is lime procured, and at what cost?
- (6) Are bricks of good quality made here? If so, what do they cost? What is the capacity of works for turning out quantities?
- (7) What building-stone is obtained in the vicinity?
- (8) Is there any hydraulic cement made in the vicinity?
- (9) What machine-shops are there in the vicinity? What kind and number of persons employed?
- (10) What is the population within, say, twenty (20) miles radius around your city?
- (11) How many men are liable to draft—i. e., between the ages of eighteen and forty-five years?
- (12) Is there any authentic register of the temperature, snow and rain fall, direction and force of winds? If so, please furnish it to us.
- (13) Where is fresh water obtained in the vicinity, and in what quantity?
- (14) Costs of rents and living for machinists, mechanics, and workmen.
- (15) What is the death-rate of the place, and what the prevailing diseases?
- (16) What is the character of the soil for building-foundations in your vicinity?
- (17) Will you give the Commission a list of the manufacturing establishments of the city, their value, and the number of men employed?
- (18) What are the means of communication with the East, the Mississippi Valley, San Francisco, and Portland, Oregon?
- (19) What is projected in the immediate future in the nature of manufacturing establishments, railways, etc.?
- (20) What are the present market rates for articles used in the construction of buildings and in iron and steel ship building?

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### APPENDIX B.

PORT GAMBLE, WASH., *March 22, 1889.*

DEAR SIR: Your favor of the 18th instant from Seattle is at hand, and in reply we would say that the railroad you refer to is the property of the Union River Logging Railroad Company, a corporation duly incorporated under the laws of the Territory of Washington, and their principal office and place of business is located at Port Gamble, Wash. Ter. Being closely connected with the railroad company in a business way, we will cheerfully answer your inquiries as follows:

The Union River Logging Railroad starts at the head of Hood's Canal (Lynch's Cove) and extends northerly. The articles of incorporation permit the railroad to extend as far north as Seabeck, on Hood's Canal, and also northeasterly to Port Washington\* and Port Orchard. At present we have only completed about 6 miles of the road, but have 4 or 5 miles additional permanently located, and the extension to Seabeck, Port Washington, and Port Orchard preliminarily located. We hand you herewith a map showing the location of the line and completed and uncompleted portion of the road. It was originally built principally for the logging business, but the articles of incorporation admit of the company doing a general transportation business, which the company is always ready and willing to do. The grade is easy, and the road well built and ballasted, twenty-six hundred ties to the mile, and 45-pound steel rails, standard gauge. The rolling stock at present consists of one 17-ton locomotive and fifteen logging cars. The road could easily and cheaply be extended to Port Orchard from its present termination, and, should the Port Townsend and Southern Railroad be built, it would be an easy matter to make the necessary connections from Clifton to Union City. The Union River Logging Railroad Company are grading an extension southerly from Clifton post-office, on the river, to a point commanding deep tide water. Should occasion offer, the company might consider a proposition to sell the plant, either to the Government or a road desiring a connection with Port Orchard. Any further information we can give you we shall be pleased to send you at your request.

We are, dear sir, yours, respectfully,

PUGET MILL COMPANY,  
Per E. G. AMES.

Capt. A. T. MAHAN,  
*Care of Lieut. U. Sebree, Portland, Oregon :*

## APPENDIX C.

PORT ORCHARD, W. T., *June 22, 1889.*

DEAR SIR: By yesterday's mail I sent you specimens from three test borings made in Jertson's Basin, the locations of which are indicated on the survey.

The augers sent you from the Mare Island navy-yard were entirely useless in the formation found here, and other attachments had to be devised and made.

*Boring No. 1* was made on the beach at high-water mark, and is about the middle of the front of the easterly half of the Jertson Basin, and took from May 20 to June 8 to bore.

The first 15 feet was through beach sand and gravel, with two very thin layers of a mixture of peat and mud.

Fifteen to 20 feet was through gravel, with a small proportion of cement and earth.

Twenty to 25 feet was through gravel, with wood, fir bark, and cones, very hard and slow boring, as the gravel had to be broken up with a drill before it could be raised to the surface.

Twenty-five to 35 feet through gravel and cement, also very hard and slow boring; the gravel had to be pulverized before it could be raised to the surface.

At 35 feet the appliance broke at the bottom in such a manner that this boring could not be continued further.

*Boring No. 2* is about 350 feet westerly from No. 1 and just inside the ridge of gravel making the shore-line; the surface is practically on a level with the high-water mark, and took from June 10 to June 15.

The first 15 feet was through beach sand and gravel.

Fifteen to 18 feet through gravel and cement; the gravel had to be broken with a drill before it could be raised to the surface.

Eighteen to 27 feet pure cement or clay.

Twenty-seven to 31 feet cement mixed with sand and occasional gravel stones with vein of fresh water.

Thirty-one to 42 feet pure cement or clay.

*Boring No. 3* is about 375 feet easterly from No 1, and inside of the ridge of gravel making the shore-line; the surface is practically on a level with the high-water mark, and it took from June 17 to June 20.

The first 15 feet was through beach sand and gravel.

Fifteen to 41½ feet through sand; as the curbing was not long enough to drive further, no solid foundation was reached.

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\* Port Washington is a local name for Dye's Inlet, a branch of the waters of Port Orchard.



Judging from the topographical features and the borings it is my opinion that there once was a cañon or "gulch," the center of which must have been very near, or a little east of, Boring No. 1, which has in course of time filled up.

In the westerly half of Jertson's Basin there are no "gulch" indications, besides a shallow well which is in clay, and clay mixed with gravel.

There was not sufficient time or funds to make borings in the Williams Basin, but from the outcroppings in the bluff east of it, and in a wall about 15 feet below high-water mark, the indications are that it is composed of layers of gravel with clay, cement, and soft sandstone rock.

Commencing at its mouth, soft sandstone rock outcrops at intervals on both sides of Port Washington Narrows at high-water mark, and down as far as the tides permit seeing.

As you perceived when here, fire has at some time run over nearly all of the entire site, burning the boundary posts, and the pitch exuding from the blazes on the trees simply facilitated their entire obliteration.

The site has  $9\frac{1}{4}$  miles of shore-line and a frontage along the water, generalizing the shore-line, of  $6\frac{1}{4}$  miles.

\* As closely as I can approximate the area inside of high-water mark "shore-line," the site contains 1,781.65 acres, which is 21.4 acres more than that given on the blueprint taken presumably from the U. S. Land Office. Further examination into boundaries may slightly change the area.\*

Assuming that the frontage on Sinclair's Inlet will be filled in to the 5-fathom line at low water, the area of the redeemed ground will be about 164.5 acres.

The anchorage room directly in front of the yard, in less than 10 fathoms and more than 4 at low water, is  $1\frac{1}{2}$  square miles.

The area of ground directly tributary to the frontage on Sinclair's Inlet that may be considered now of practicable slope for heavy wagons or loads, merely correcting for irregularities, is about 392 acres.

The additional amount directly tributary to Sinclair's Inlet that could be made of such practicable shape, without what would be considered a heavy or undue expenditure for grading, is about 150 acres.

The westerly or Jertson Basin has a ridge in about the middle of it, averaging about 15 feet high, which separates it into two parts. The westerly half has room to construct dry docks 750 feet wide and three-fourths of a mile long; the easterly half, 650 feet wide and three-fourths of a mile long. Not taking the ridge into account, for really it is of slight moment and would be good to borrow from for filling in the water front, there is an available space 1,800 feet wide and three-fourths of a mile long.

It would seem probable that in case dry-docks were built in this basin, on account of the water deepening very gradually, they would extend in a great measure outside of high-water mark, as the sea-wall in front would be about 1,100 feet outside of the shore-line.

The easterly or Williams Basin is about 1,400 feet wide at the front and extends back about the same distance, contracting to a point.

By to-day's mail I send you a tracing of all of my work to date. I have made a great effort to make it more complete, but it has been simply impossible.

The contouring on the Sinclair's Inlet side has been carried out, considering the dense growth, with a great deal of precision and care, necessitating much cutting.

As the opposite side is of minor importance, and being much more irregular and complicated, to actually survey it would take a long time; so am obliged to sketch it in and generalize it in a great measure.

All the shore-line on the tracing has been carefully surveyed.

As it was impossible to have the old soundings replotted in the office, they have been plotted on this work by enlarging four times a copy of the old work, which necessarily generalizes them to a great extent, and can be recognized by being farther apart than the new ones are.

Trusting that this will reach you before the 30th, I remain,

Very truly,

J. T. PRATT,  
Assistant, U. S. C. and G. Survey.

Capt. A. F. MAHAN, U. S. N.,

President Navy Yard Site Commission, Northwest Coast, Washington, D. C.

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\* Further less hurried examination of interior of site gave total acreage to be 1,752.3 acres.

## APPENDIX D.

U. S. COAST AND GEODETIC SURVEY LAUNCH,  
Admiralty Inlet, Wash. Ter., June 8, 1889.

My DEAR CAPTAIN: To-day I have made a trip to Blake Island, climbed to its summit and looked it over as much as my limited time would allow. The entire island is covered with trees and bushes, the crest or summit is on the westerly part and is about 250 feet above high-water mark, gradually sloping down in all directions to the bluff line, which ranges from a few feet to 100 in height; the highest bluff appears to be on the west side; the ascent from the easterly end, where there is no bluff, to the summit is gradual.

On the west side there is a good spring and of sufficient size, if none of the water was allowed to run to waste, to supply a good sized colony.

For this country the shape of the higher portion is exceptionally favorable for earthworks, etc., being much more regular and with fewer gulches than usual.

Very truly,

J. F. PRATT.

Capt. A. T. MAHAN, U. S. N.,  
Newport, R. I.

## APPENDIX E.

## PROPOSED NAVY-YARD SITE, NORTHWEST COAST.

Owners of property, with estimated values and prices for which it can be purchased.

[Township 24 north, Range 1 east, Kitsap County, Washington Territory.]

No.	Owners.	Description.	Acres.	Estimated values.			Owner's value.
				Per acre.	Per lot.	Total.	
1	Warren Smith...	Lot 1, section 13 .....	34.50	\$18	\$621.00	\$7,032.50	\$7,032.50
		Lot 2, section 13 .....	53.50	15	802.50		
		NE. $\frac{1}{4}$ of SE. $\frac{1}{4}$ , section 14 .....	40.00	18	720.00		
		SE. $\frac{1}{4}$ of NE. $\frac{1}{4}$ , section 14 .....	40.00	20	800.00		
		Lot 3, section 14 .....	35.50	18	639.00		
		Improvements .....			3,450.00		
			203.50				
2	Wm. Williams....	Lot 3, section 3 .....	51.25	15	768.75	3,236.25	*5,000.00
		Lot 1, section 24 .....	16.50	15	247.50		
		Lot 1, section 23 .....	24.00	20	480.00		
		Lot 2, section 23 .....	37.00	20	740.00		
		SE. $\frac{1}{4}$ of SE. $\frac{1}{4}$ , section 14 .....	40.00	20	800.00		
		Improvements .....			200.00		
			168.75				
3	Rol't Jertson....	Lot 3, section 23 .....	24.00	15	360.00	3,825.00	5,000.00
		Lot 4, section 23 .....	20.25	20	405.00		
		NW. $\frac{1}{4}$ of NW. $\frac{1}{4}$ , section 23 .....	40.00	20	800.00		
		Lot 1, section 22 .....	35.00	20	700.00		
		NE. $\frac{1}{4}$ of NE. $\frac{1}{4}$ , section 22 .....	40.00	20	800.00		
		Improvements .....			760.00		
			159.25				
4	Wm. P. Sayward..	NE. $\frac{1}{4}$ of NW. $\frac{1}{4}$ , section 23...	40.00	15	600.00		1,000.00
5	Kiernan Daly.....	Lot 1, section 14 .....	39.50	18	711.00	1,336.50	11,336.50
		Lot 2, section 14 .....	35.75	18	625.50		
			74.25				
6	John Sigo .....	SE. $\frac{1}{4}$ of SE. $\frac{1}{4}$ , section 10.....	40.00	18	720.00	720.00	1,600.00
7	Chas. Anderson...	SE. $\frac{1}{4}$ of NW. $\frac{1}{4}$ , section 14....	40.00	15	600.00	600.00	300.00

\* A verbal offer of \$5 000 was made by the owner of this property, but not confirmed, as the man's father advised charging \$100 per acre.

† Declined to make offer and estimated value taken.

‡ Verbal offer of \$300 if taken immediately.

*Owners of property, with estimated values and prices, etc.—Continued.*

No.	Owners.	Description.	Acres.	Estimated values.			Owner's value.
				Per acre.	Per lot.	Total.	
8	Chas. Jackson ...	Lot 6, section 11 .....	40.00	\$18	\$720.00	} \$858.00	*\$1,200.00
		Lot 7, section 11 .....	3.50	18	63.00		
		Improvements .....	.....	.....	75.00		
			43.50				
9	John Simmons...	Lot 7, section 10 .....	53.50	20	1,070.00	} 1,690.00	2,500.00
		Lot 6, section 10 .....	24.00	20	480.00		
		Improvements .....	.....	.....	340.00		
			77.50				
10	Charlie Sam .....	Lot 1, section 10 .....	51.25	18	922.50	} 1,922.50	1,500.00
		Improvements .....	.....	.....	1,000.00		
11	Jos. W. Sackman..	Lot 7, section 3.....	31.00	15	465.00	465.00	600.00
12	D. J. Sackman ...	Lot 6, section 17.....	59.75	25	1,493.75	1,493.75	1,500.00
13	Freeman W. Bass.	Lot 5, section 3.....	58.50	18	1,053.00	} 4,710.00	†4,710.00
		Lot 6, section 3.....	61.50	18	1,107.00		
		Improvements .....	.....	.....	2,550.00		
			120.00				
14	Swan Anderson...	E. $\frac{1}{2}$ of NE. $\frac{1}{4}$ , section 15.....	80.00	18	1,440.00	} 2,020.00	‡1,635.00
		Lot 6, section 10 .....	29.00	20	580.00		
		.....	109.00				
15	Government .....	NE. $\frac{1}{4}$ of SE. $\frac{1}{4}$ , section 15 .....	40.00				
		Not yet claimed.					
16	John P. Anderson (Claimant.)	SW. $\frac{1}{4}$ of NE. $\frac{1}{4}$ , section 14 .....	40.00				
		NW. $\frac{1}{4}$ of SE. $\frac{1}{4}$ , section 14 .....	40.00				
		E. $\frac{1}{2}$ of SE. $\frac{1}{4}$ , section 14 .....	80.00				
		Improvements .....	.....		920.00	} 1,020.00	1,000.00
		Damage changing claim .....	.....		100.00		
			160.00				
17	Howard Kimball .. (Claimant.)	W. $\frac{1}{2}$ of W. $\frac{1}{4}$ , section 14 .....	100.00				
		Improvements .....	.....		500.00	} 600.00	1,000.00
		Damage changing claim .....	.....		100.00		
18	Chas. Jackson .... (Claimant.)	Lot 2, section 10 .....	47.00				
		Lot 3, section 10 .....	41.50				
		Lot 5, section 10 .....	36.00				
		Improvements .....	.....		400.00	} 500.00	1,000.00
		Damage changing claim .....	.....		100.00		
			124.50				
19	John Bowers .... (Claimant.)	Lot 4, section 10 .....	36.75				
		Damage changing claim .....	.....		100.00	100.00	50.00
20	Syvert, Johnson.. (Claimant.)	SE. $\frac{1}{4}$ of SE. $\frac{1}{4}$ section 15.....	40.00		100.00	100.00	
		Damage changing claim .....	.....				
		No offer. Johnson could not be found. Thought to have given up claim.					
21	Robert Engdahl .. (Claimant.)	SW. $\frac{1}{4}$ of SE. $\frac{1}{4}$ section 14.....	40.00				
		Damage changing claim .....	.....		100.00	100.00	
		No offer. Engdahl could not be found. Thought to have given up claim.					
		Grand total .....	1,810.00			33,129.00	37,964.00

\* Title of lot 6 doubtful. (See county auditor's abstract.)

† Declined to set price. Would leave it to appraisement.

‡ Title doubtful. Property mortgaged. Could not set price, but thought \$15 per acre fair price.

## APPENDIX F.

**RECORD OF THE PROCEEDINGS OF THE COMMISSION APPOINTED TO SELECT A SITE FOR A NAVY-YARD NORTH OF THE FORTY-SECOND PARALLEL OF NORTH LATITUDE, IN THE STATE OF OREGON AND TERRITORIES OF WASHINGTON AND ALASKA.**

ROOM 114, NAVY DEPARTMENT,  
*Washington, D. C., December 11, 1888.*

The Commission met at 11 a. m. under orders from the honorable Secretary of the Navy. Owing to a delay in issuing the orders, the Commission was unable to meet upon the day appointed by them, December 3, 1888.

Present: Capt. Alfred T. Mahan, U. S. Navy; Commander C. M. Chester, U. S. Navy; and Lieutenant-Commander Charles H. Stockton, U. S. Navy.

The instructions of the honorable Secretary of the Navy to the president of the Commission, Capt. A. T. Mahan, were presented and read by the members of the Commission.

The Commission in a body called upon the Chief of Engineers of the Army, and were offered the facilities of the office.

The charts of the sea-coast, ports, and anchorages of the State of Oregon and Territories of Washington and Alaska were examined by the Commission, reserving after this examination the charts of the Columbia River and its approaches, the Strait of Juan de Fuca, and the waters in and about Puget Sound and Alaska for further examination.

The Commission, at 3.30 p. m., adjourned.

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ROOM 144, NAVY DEPARTMENT,  
*Washington, D. C., December 11, 1888.*

The Commission met at 10.30 a. m., pursuant to adjournment, all the members of the Commission being present.

Commander Chester presented charts, publications, and other data, from the Coast Survey Office.

An examination was made by the Commission of the charts of the Columbia River and its bar, and of the harbors and anchorages in Alaskan waters.

A letter was addressed to the honorable Secretary of the Navy by the president of the Commission, announcing the meeting and organization of the Commission and the receipt of the instructions of the Secretary from the Chief of the Bureau of Yards and Docks.

The Commission continued its examination of the charts of the waters and coasts specified in the act of Congress, examining the harbors along the southern shores of the Strait of Juan de Fuca, the upper part of Admiralty Inlet, and Hood's Canal.

It was determined to visit and examine Port Discovery, Port Townsend, Port Ludlow, Port Gamble, Port Madison, and the lower end of Hood's Canal from Union City to Lynch's Cove.

The Commission at 3.20 p. m. adjourned.

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ROOM 114, NAVY DEPARTMENT,  
*Washington, D. C., December 12, 1888.*

The Commission met pursuant to adjournment at 10.30 a. m., all the members being present.

An advance sheet of a chart of the waters of Puget Sound and additional data from the office of the Chief of Engineers of the Army were presented to the Commission.

An examination of the waters of Admiralty Inlet and Puget Sound was entered into by the Commission, and as a result it was considered desirable that the Commission should visit and examine personally the towns and harbors of Seattle and Tacoma, and the waters of Port Orchard, Quartermaster's Harbor, Steilacoom Harbor, and the upper part of Puget Sound, including Budd's Inlet and the vicinity of Olympia.

An examination was made of the vicinity of Bellingham Bay and the archipelago of the San Juan Islands, the question of personally visiting these localities being left for further consideration.

An examination was made of the railroads terminating in the vicinity of Puget

Sound as shown on the map furnished from the office of the Chief of Engineers of the Army, and of the plans of the proposed ship-canal near Seattle, to extend from the Sound to Lakes Union and Washington.

At 3 p. m. the Commission adjourned.

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ROOM 114, NAVY DEPARTMENT,  
*Washington, D. C., December 13, 1888.*

The Commission met at 11.30 a. m., all the members being present. Additional data were presented from the Coast Survey office. The examination of various points upon Puget Sound and Admiralty Inlet was continued.

At 12.30 o'clock the Commission proceeded to the Coast Survey office to examine the original sheets of the hydrographic and topographic surveys of various points upon and near Puget Sound.

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ROOM 114, NAVY DEPARTMENT,  
*Washington, D. C., December 14, 1888.*

The Commission met at 10.15 a. m. All the members were present. Additional data were presented from the office of the Chief of Engineers of the Army. A letter was addressed by the president of the Commission to the Chief of the Bureau of Yards and Docks, asking for an allotment of funds from the appropriation for defraying the expenses of the Commission; \$3,000 to be placed to the credit of the purchasing paymaster at San Francisco, Cal., and \$1,000 to be placed to the credit of the purchasing paymaster at Washington, D. C. A letter was also addressed to the Chief of Engineers of the Army by the president of the Commission, relative to the principal lines of defense on Puget Sound and the Columbia River, and also asking for data in regard to the plans for the improvement of various harbors upon the northwest coast.

A letter was also directed to the honorable Secretary of the Navy, asking authority to employ a clerk to keep a record of the proceedings of the Commission and for other clerical purposes as required by law. A letter was received from Commodore Harmony, Chief of the Bureau of Yards and Docks, announcing that the Bureau had drawn upon the honorable Secretary of the Navy for the amount of money asked for by the Commission.

A letter was directed to the Second Comptroller of the Treasury, asking an opinion as to the legality of the payment of traveling expenses of a clerk, in case his appointment should be authorized.

At 4 p. m. the Commission adjourned.

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ROOM 114, NAVY DEPARTMENT,  
*Washington, D. C., December 15, 1888.*

The Commission met at 10.30 a. m., all the members being present. After discussion it was determined to address questions as to the resources, characteristics, etc., of various localities, to the mayors or leading persons of the places.

A circular letter was drawn up and the formulation of the questions discussed.

A conference was held by the Commission, with Colonel Mendell, of the Army, the division engineer of the Pacific coast, and Major Post, of the office of the Chief of Engineers of the Army, in regard to the principal lines of defense, harbor improvements on the Pacific coast, and the canal projected to run from the Sound to Lakes Union and Washington.

At 3.30 o'clock the Commission adjourned.

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ROOM 114, NAVY DEPARTMENT,  
*Washington, D. C., December 17, 1888.*

The Commission met at 10.30 a. m., and after an informal discussion the members separated to collect data at the Coast Survey Office and Office of U. S. Geological Survey. A list of questions relative to the resources of various localities having been decided upon, a copy was addressed to the mayor of Portland, Oregon.

ROOM 114, NAVY DEPARTMENT,  
Washington, D. C., December 18, 1888.

The Commission met at 10.45 a. m., all the members being present. After discussion, the following was adopted as the views of the Commission upon the proper interpretation of the first requirement of the instructions for the location of a navy-yard site on the northwest coast of the United States:

"It is the opinion of the Commission that the conditions for special requirements, as per the instructions of the honorable Secretary of the Navy of November 30, 1888, viz, 'A situation upon a good harbor of sufficient size, depth, and accessibility for vessels of the largest size and heaviest draught,' prevents any harbor which is obstructed by a bar having a less depth than found on the San Francisco bar (33 feet at mean low water), or not having possibilities for at least that amount of water, from being considered as suitable."

A list of questions as to resources, etc., was sent to the Hon. J. M. Siglin, Marshfield, Oregon (on Koon Bay).

The Commission having finished its preliminary work, reported verbally to the office of detail its readiness to proceed to the Pacific coast.

At 1 p. m. the Commission adjourned to await orders from the Secretary of the Navy.

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PALACE HOTEL, SAN FRANCISCO, CALIFORNIA. *February 2, 1889.*

The Commission met at 10.30 a. m., and, after an informal discussion, arrangements were made to visit the Coast Survey office in this city, gather data, and attend to matters concerning the object of the Commission.

A recess was then taken until 3 p. m.

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PALACE HOTEL, SAN FRANCISCO, CALIFORNIA, *February 2, 1889.*

The Commission met at 3 p. m., pursuant to recess, having visited during the day the Coast Survey office, the Navy pay office, and the office of Civil Engineer Bloomfield, on business connected with the work of the Commission.

The proceedings of the Commission at its last meeting, December 18, 1888, were read and approved.

It was decided to proceed to Mare Island on Monday in order to confer with the commandant of the navy-yard there.

It was directed that the following statement of events, occurring since the last meeting of the Commission of December 18, 1888, should be formally entered in the report of the proceedings.

After the last meeting, as the result of a conference between the president of the Commission and the Chief of Engineers of the Army, Captain Mahan proceeded to New York to consult with the members of the Board of Fortifications of the Army. While there he was taken ill and a certificate of his attending surgeon duly forwarded to the honorable Secretary of the Navy, reporting that he was unable to proceed to the Pacific coast in obedience to his orders. He was not reported in condition to travel until January 21, 1889, when the Commission proceeded to San Francisco, which place all the members reached by February 1. The orders of the Secretary of the Navy to the president and members of the Commission were so worded that all were required to proceed with the president of the Commission.

The letter addressed to the honorable Secretary of the Navy requesting authority to appoint a clerk to the Commission was approved by the Secretary, who required the name and salary to be submitted for his further approval. The name of Mr. Charles E. Kern having been submitted by the Commission with the request for his appointment as clerk and stenographer, he was duly appointed on December 28, 1888, by the honorable Secretary of the Navy, in that capacity at a salary of \$100 per month.

Under date of December 24, 1888, the president of the Commission received a letter from the honorable Secretary of the Navy inclosing, for the information of the Commission, a copy of a letter from the Secretary of the Treasury, dated December 20, 1888, covering copies of letters from the naval secretary of the Light-House Board and the Superintendent of the United States Coast and Geodetic Survey, announcing that the officers of the Light-House Establishment and Coast Survey will assist the Commission in every way in their power, and that the inspector of the thirteenth light-house district had been directed to be at Olympia, Wash., to receive the Commission and to transport it to such points as it may desire to visit.

A letter was received by the president of the Commission, dated December 26, 1888, from the Chief of Engineers of the Army in regard to the principal formulated lines of

defense and projected river and harbor improvements other than those contained in the published reports of the Chief of Engineers.

A letter dated December 28, 1888, was also received by the president of the Commission from Lieut. U. Sebree, light-house inspector, thirteenth district, announcing that the light-house tender will be ready at any time and at any place the Commission desires.

The above letters were read and discussed, and the Commission adjourned.

PALACE HOTEL, SAN FRANCISCO, CAL., *February 5, 1889.*

The Commission met at 10 o'clock a. m., having on Monday visited the Mare Island navy-yard to confer with the commandant, when arrangements were made to have boring tools sent to Seattle.

The proceedings of the Commission on Saturday were read and approved.

It was decided to request Lieutenant Sebree to have the light-house tender at Tacoma, instead of Olympia, to meet the Commission. It was also decided to proceed to Portland, Oregon, by the 7 o'clock train to-morrow evening.

The Commission then adjourned.

OFFICE LIGHT-HOUSE INSPECTOR, THIRTEENTH DISTRICT,  
*Portland, Oregon, February 8, 1889.*

The Commission having left San Francisco on Wednesday, the 6th instant, arrived in Portland at 11 o'clock this morning and assembled at 2 p. m. and met a committee from the Board of Trade of Portland, consisting of Hon. George H. Williams, General William Kapus, and Mr. George P. Frank, who presented a memorial setting forth the advantages of the Columbia River as a site for the proposed navy-yard on the Pacific coast north of the forty-second parallel.

The Commission then adjourned to meet to-morrow morning at 9.30 o'clock.

OFFICE LIGHT-HOUSE INSPECTOR, THIRTEENTH DISTRICT,  
*Portland, Oregon, February 9, 1889.*

The Commission assembled at 9.30 o'clock this morning.

The proceedings of the meetings of February 5 and 8 were read and approved.

The president presented the following papers, which were addressed to the Commission:

A letter from Mr. W. T. Webber, of Newport, Oregon (Yaquina Bay), giving replies to the questions that had been sent out by the Commission from Washington.

A letter from Hon. A. H. Chambers, mayor of Olympia, Washington Territory, presenting answers to the questions submitted by the Commission and making offers of assistance when the Commission should arrive in Olympia.

A letter inclosing a list of answers to the interrogatives of the Commission from General J. M. Siglin, Marshfield, Oregon, on Koon Bay.

The papers were filed for further consideration.

The memorial presented yesterday by the committee of the Board of Trade of Portland, Oregon, was read aloud by the president of the Commission, all the members being present.

A letter from Robert Moran, esq., mayor of Seattle, Washington Territory, dated January 8, 1889, was presented by the president of the Commission, it being in regard to the interrogatories received from the Commission, announcing that a committee had been appointed to answer the questions and furnish such other information as may be required.

A letter was also received from Rev. T. S. Weeks, San Juan Island, Washington Territory, calling the attention of the Commission to Man-of-War Harbor, in San Juan Island, as a site for the proposed navy-yard.

Gen. George P. Ihrie, of Port Townsend, Washington Territory, presented himself before the Commission as the bearer of the answers, from the mayor and Board of Trade of Port Townsend, to the questions sent out by the Commission from Washington. These he delivered, together with a map of Port Townsend and vicinity.

The answers to the questions addressed to Koon Bay and Yaquina River having been duly presented and read aloud to the Commission, a memorandum of the hydrographic conditions of these harbors, compiled from the Coast Survey charts and other sources, was also read aloud, as well as a statement of the proposed improvements of these harbors by the engineers, United States Army.

After discussion it was determined that, as the available depth of water at the entrance of these harbors was inadequate, the channels shifting and uncertain, the bars often impassable by reason of the sea breaking, and the resources and internal communications limited, these places did not meet the requirements for a naval station, and consequently a visit to them was unnecessary.

The Commission then adjourned to meet on Monday morning, at 9.30 o'clock.

OFFICE LIGHT-HOUSE INSPECTOR, THIRTEENTH DISTRICT,  
*Portland, Oregon, February 11, 1889.*

The Commission met at 9.30 o'clock, pursuant to adjournment.

The proceedings of the last meeting were read and approved.

On Saturday after adjournment, the Commission, in company with a committee of the Board of Trade of Portland, visited the Oswego Iron Works and the mines from which the ore used in the works is obtained.

The president presented the following papers received since the last meeting:

A letter from Messrs. Samuel Collyer and S. A. Wheelwright, a committee of the Tacoma (Wash.) Chamber of Commerce, inclosing replies to the interrogatories relative to a navy-yard site on the northwest coast.

A letter from C. H. Page, mayor of Astoria, Oregon, giving answers to the interrogatories relative to the selection of a navy-yard site.

A letter from Messrs. William H. Brewster, president, and John H. Elwell, secretary, of the Vancouver (Wash.) Board of Trade, giving answers to the interrogatories relative to the selection of a navy-yard site.

Interrogatories were sent to the editor and proprietor of the Pacific Journal, Oyster-ville, Wash. (Shoalwater Bay), and to the editor and proprietor of the Aberdeen Herald, Aberdeen, Wash. (Gray's Harbor), relative to the advantages of their respective localities for a naval station.

The Commission then decided to leave Portland to-morrow, February 12, for Tacoma, there to join the light-house tender *Manzanita* and proceed at once to Seattle, Wash., in order to begin, without loss of time, an examination into the hydrographic conditions of Lake Washington and ascertain the topography of its shores, on which points precise information is as yet wanting.

The Commission then adjourned to meet again at Seattle, Wash.

UNITED STATES LIGHT-HOUSE TENDER MANZANITA,  
*Seattle, Wash., February 13, 1889.*

The Commission met at 12 o'clock.

The proceedings of the last meeting were read and approved.

It was directed that the following statement of events occurring since the last meeting of the Commission should be entered in the proceedings:

On Tuesday evening, February 12, the Commission embarked on board the United States light-house tender *Manzanita* at Tacoma, and proceeded on the following morning to Seattle. A joint committee from the Board of Trade, Chamber of Commerce, and City Council of Seattle waited upon the Commission, and it was arranged that on the next day the Commission, in company with several members of the above committee, should visit Lakes Union and Washington.

On February 14, at 9.30 o'clock a. m., the Commission left the *Manzanita*, in pursuance of the above arrangement, and entered Salmon Bay from the Sound by water. At the head of Salmon Bay the cars were taken to Lake Union, when the Commission embarked on a steam-launch and passed through Lake Union, sounding on the way. The small canal connecting Lakes Union and Washington was inspected, together with the character of the soil, and the Commission was then transferred to the steamer *Kirkland* at Union Bay, Lake Washington. The steamer went over to Kirkland and thence skirted the lake by the east shore, passing around Mercer Island, thence to the end of the cable road, where the Commission disembarked at 5 p. m.

On Friday, February 15, the Commission again embarked on board the *Kirkland* and continued the examination, taking in the northern part of the lake, and then examined more minutely those localities which had been noted as most promising on the first inspection.

The president presented the following communications, which had been received since the last meeting:



A letter from Mr. Alexander Begg, of Seattle, Washington Territory, giving answers to interrogatories relative to the advantages of Seattle as a navy-yard site.

A letter from E. L. Shannon, of Portland, Oregon, calling attention to the advantages of Similk Bay, Washington Territory, for a navy-yard site, and inclosing newspaper clippings giving information regarding the same.

A letter from Maj. W. A. Jones, U. S. Engineers, of Portland, Oregon, inclosing a letter from Capt. Edward Eldridge, calling attention to Bellingham Bay as a possible navy-yard site.

A letter from Charles A. Barnes, of Seattle, Washington Territory, calling attention to the Elliott Bay tide-flats as a site for the proposed navy-yard.

The Commission having made a sufficient preliminary examination of Lake Washington to supply the information before lacking, it was decided to proceed on Monday, the 18th instant, to Olympia, Washington Territory, there to begin a systematic examination of the waters of Puget Sound.

The Commission then adjourned, having previously listened to a reading of the answers to the questions forwarded by the authorities of Olympia regarding the advantages of that place as a navy-yard site.

UNITED STATES LIGHT-HOUSE TENDER MANZANITA,  
*Olympia, Wash., February 20, 1889.*

The Commission met at 4.30 o'clock.

The proceedings of the last meeting were read and approved.

It was directed that the following statement of events occurring since the last meeting be entered in the proceedings of the Commission:

Leaving Seattle on February 18, on board the *Manzanita*, the Commission proceeded to Olympia, arriving there on the same day at 1 o'clock p. m. A visit was received from the mayor and a committee from the Board of Trade and city council of Olympia. In the afternoon they visited Tumwater, and were shown the Deschutes River and water power.

At 8.30 on the morning of the 19th the Commission left the *Manzanita* in a Coast Survey launch, visiting Gull Harbor (or Wepusee Inlet), thence proceeding along the east shore of Budd's Inlet to Cooper's Point, down Eld Inlet, and returning along the west shore of Budd's Inlet to Butler's Cove.

In the afternoon of the same day the Commission, on board the *Manzanita*, inspected Totten Inlet and Squaxin Island.

On the morning of the 20th instant the Commission, on board the *Manzanita*, inspected Case's Inlet, passing through Pickering Passage, west of Hartstone Island, to the extreme limit of the inlet, and returning through the passage to the eastward of the island, thence through Drayton Passage, Balch's Passage, to the east and south of Anderson's Island, and returning to Olympia inspected Henderson's Inlet.

The Commission then adjourned.

UNITED STATES LIGHT-HOUSE TENDER MANZANITA,  
*Tacoma, Wash., February 21, 1889.*

The Commission met at 2 p. m.

The proceedings of the last meeting were read and approved.

It was directed that the following statement of events occurring since the last meeting be entered in the proceedings:

At 9.30 this morning the Commission commenced a reconnaissance of the south shore of Nisqually Reach, passing to the eastward near Luskip Bank. The steamer then headed for Hyde Point, skirting the north shore of McNeil's Island, and looking into Gertrude's Cove, all the points along the course being observed and the characteristics noted. Afterwards the entire shore line of Carr's Inlet was passed in review and notes made of the character of promising sites. The *Manzanita*, on returning, passed between Fox Island and the mainland, the Commission making notes, and then went to Steilacoom, where the Commission landed and walked over the town, observing the character of the ground.

The tender then proceeded to Tacoma, arriving there at 5.30 o'clock p. m.

UNITED STATES LIGHT-HOUSE TENDER MANZANITA,  
*Seattle, Wash., February 25, 1889.*

The Commission met at 4.30 p. m.

The proceedings of the last meeting, February 21, were read and approved.

The following statement of events occurring since the last meeting was approved and it was directed that it be entered on the record:

The Commission reached Tacoma at 5.30 p. m. of the 21st instant. On the following day a visit was received from a committee of citizens, and later in the day the Commission visited the different parts of the city.

On the 23d instant the Commission left Tacoma at 8.30 a. m. and visited Gig Harbor, Quartermaster's Harbor, and the east shore of Commencement Bay, making observations of the character of the shores, and landing when considered necessary.

On the 25th instant, at 6.30 a. m., the Commission left Seattle on board the *Manzanita*, and proceeded by Colvos's Passage to Port Orchard, entering by Rich's Passage. They visited Dye's Inlet and passed around its shores, then returning to Port Orchard skirted its entire shore line, making full notes of its character and especially of such parts as seemed to offer promising sites for a navy-yard. In the course of the reconnaissance the tender passed through Agate Passage.

The reconnaissance being finished the Commission proceeded to Seattle, arriving there at 5 p. m.

A letter was received from Mr. Joseph W. Dorr, editor of the Journal, Blaine, Wash., calling attention to the advantages of that site for the location of a navy-yard.

UNITED STATES LIGHT-HOUSE TENDER MANZANITA,  
*Nearing Whatcom, Wash., February 28, 1889.*

The Commission met at 5 p. m.

The proceedings of the last meeting, February 25, were read and approved.

It was directed that the following statement of events occurring since the last meeting be recorded in the proceedings:

On the morning of February 26, the Commission took a special train from Seattle, placed at its disposal by the officers of the Seattle, Lake Shore and Eastern Railroad Company, and went as far as the present terminus of the road, visiting on the way two of the coal mines which are on the line, and returning to Seattle at 4.30 p. m.

At 11.30 a. m., of February 27, the Commission left Seattle in the *Manzanita* and went to Possession Sound, keeping along the east shore of Puget Sound. They entered and skirted the shores of Port Susan and then proceeded to Saratoga Passage, looking into Holmes's Harbor and Penn's Cove, and at 6.30 p. m. anchored off Utsalady.

During the trip observations were taken and notes made of the character of the shores, soundings being taken when necessary.

No sites were observed that, from the topography, soundings as shown on the Coast Survey charts, position and nearness to centers of resources, approached in desirability sites already visited by the Commission.

On February 28th the *Manzanita* with the Commission on board, got under way from Utsalady at 7 a. m., and proceeded to Similk Bay at reduced speed, sounding constantly.

At Hope Island, while moving very slowly, soundings were taken along the west end and close to the north shore and thence over to the east shore of the bay. The tender came to anchor at 8.30 o'clock in four (4) fathoms of water, and an examination was made of Similk Bay and its vicinity in a boat, lines of soundings being run to determine the hydrography, the topography of the shore-line being noted.

At 12.30 o'clock the *Manzanita* got under way and passed through Deception Pass, thence through Rosario Straits to Ship Harbor and Bellingham Bay, noting characteristics of the shore while passing by.

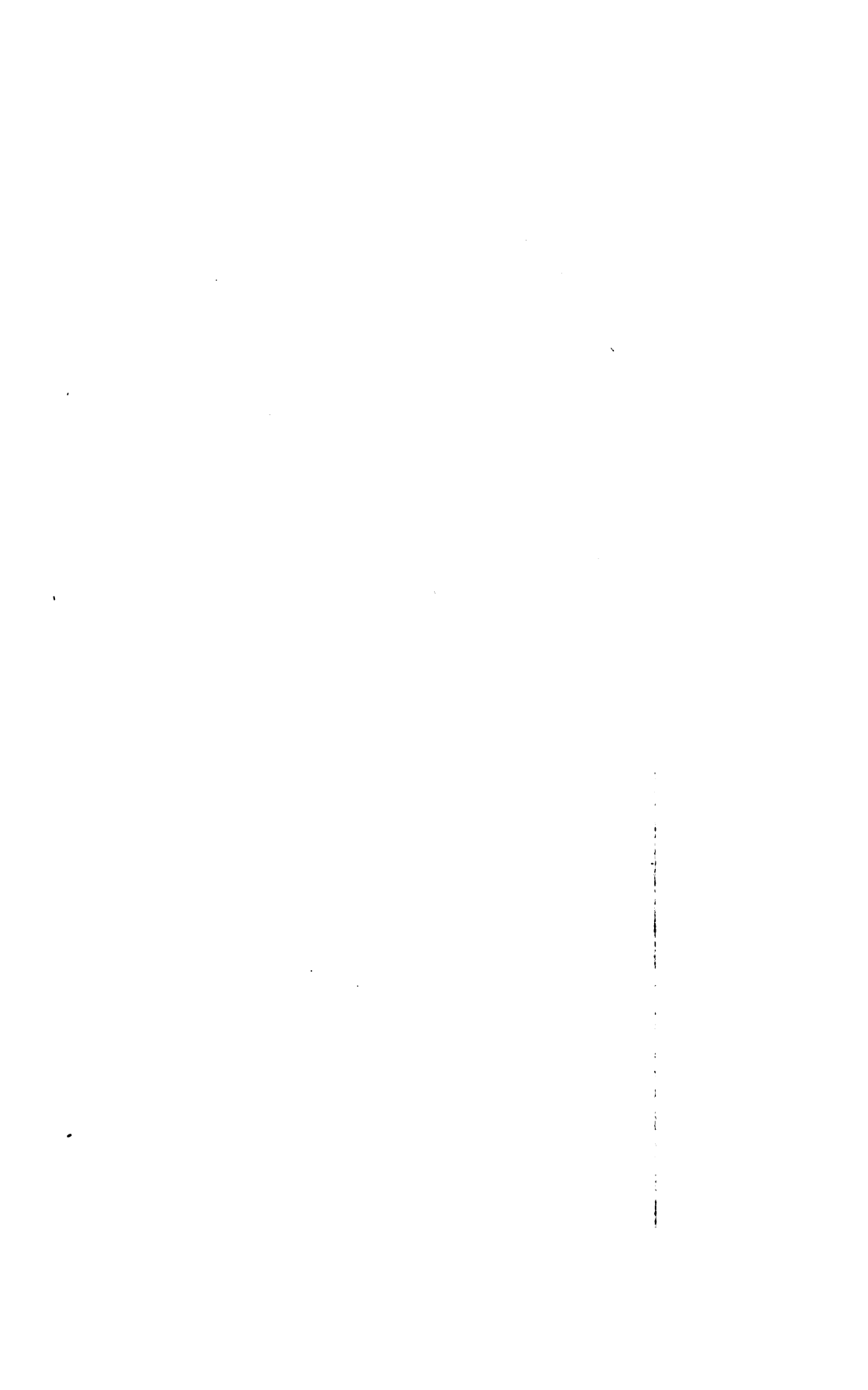
UNITED STATES LIGHT-HOUSE TENDER MANZANITA,  
*East Sound, Orcas Island, W. T., March 2, 1889.*

The Commission met at 10.30 a. m.

The proceedings of the last meeting, February 25th, were read and approved.

It was directed that the following statement of events, occurring since the last meeting, be entered in the proceedings.

At 6.45 p. m. of February 28th, the *Manzanita* anchored off Whatcom,



Ingham Bay, the San Juan Islands, and the more important harbors on the Straits of Juan de Fuca, proceeded to discuss the comparative merits of the sites noted, and after discussion decided to proceed to-morrow to a closer examination of Port Orchard, in order to determine how far it meets satisfactorily the conditions imposed by the Navy Department's letter of instructions of November 30, 1888.

UNITED STATES LIGHT-HOUSE TENDER MANZANITA,  
*Nearing Tacoma, Wash., March 12, 1889.*

The Commission met at 8 p. m.

The proceedings of the last meeting, March 8, were read and approved.

It was directed that the following statement of events, occurring since the last meeting, be entered in the report of the proceedings:

On March the 8th, at 6.45 a. m., the *Manzanita* got under way, standing a little further up towards Lynch's Cove, and then turned about and stood down the upper part of Hood's Canal, following the southern shore-line.

The Commission stopped at Union City, where information was obtained concerning various logging railroads at the head and vicinity of Hood's Canal. The tender then stood up the northern arm of Hood's Canal, coasting along the east side, then standing out of Hood's Canal into Admiralty Inlet, and at 6 p. m. the Commission returned to Seattle.

On March 9, at 8 a. m., the Commission left Seattle in the *Manzanita* and proceeded to Port Orchard, and at 9.30 anchored off Point Turner. The Commission landed and inspected a part of the ground there; and afterwards two members, accompanied by Assistant J. F. Pratt, of the U. S. Coast and Geodetic Survey, crossed the peninsula from Sinclair's Inlet to Dye's Inlet. In the afternoon there came on board A. Williams and Warren Smith, landholders on the point; and also A. H. Sroufe, editor of the Kitsap County Pioneer, published at the neighboring village of Sidney, and conversation was had with them relative to prices of land, etc.

Inquiries were made at Sidney to ascertain the development and resources of the surrounding country. At 6 p. m. the *Manzanita* again made fast to the wharf at Seattle.

At 9.30 a. m. of the 11th instant the *Manzanita* was again anchored in Dye's Inlet, abreast of the house of Warren Smith. A number of owners and claimants of land under the land laws of the United States were assembled, and from them was obtained the prices at which they were willing to sell or to relinquish their claims, having respect to the improvements made by them.

A further examination of the face of the country from Point Turner along the shore of Dye's Inlet, taking in Warren Smith's place, was made, including Phinney's Bay.

On March 12 the tender left Seattle at 10 a. m., Commander Chester remaining in the city to make inquiries at the land office and office of the district attorney relative to the valuation and appraisalment of lands, etc.

The president of the Commission sent a telegram to-day to the Superintendent of the United States Coast and Geodetic Survey, requesting that Assistant Pratt be authorized to make a survey for a navy-yard site.

The *Manzanita* arriving in Port Orchard, Captain Mahan and Lieutenant-Commander Stockton, accompanied by Assistant Pratt, landed at the property of Robert H. Jertson and walked over the greater part of it, noting the character of the topography.

Soundings were taken off Point Turner to determine the character of the bottom within the five (5) fathom line, as to which no sufficient information was found on the chart. The topography of the country walked over was carefully observed, heights taken approximately, etc. The point on the west side of Phinney's Bay was further examined, and the point of entrance into Dye's Inlet of the outlet of Kitsap Lake was ascertained.

The following letters were received by the president of the Commission and were presented:

From Mr. Alf. D. Bowen, proprietor of the Pacific Journal, of Oysterville, Wash., showing the advantages of Shoalwater Bay as a navy-yard site.

From Mr. Henry Drum, of Tacoma, Wash., inclosing a communication from Mr. W. J. Thompson, the latter suggesting the east side of Commencement Bay as a suitable site for a navy-yard.

From Mr. George E. Filley, of Aberdeen, Wash., giving information relative to advantages of that locality as a navy-yard site.

From Mr. E. D. Warbass, of Roche Harbor, Wash., giving information relative to advantages of Griffin's Bay, or Man-of-War Harbor, Wash., as a navy-yard site.

The Commission received the boring-tools sent from the navy-yard, Mare Island, California, on board the *Manzanita*, yesterday.

UNITED STATES LIGHT-HOUSE TENDER MANZANITA,  
*Off Point Turner, Port Orchard, Wash., March 18, 1889.*

The Commission met at 12.10 p. m.

The proceedings of the last meeting, March 12, were read and approved.

The following statement of the movements and proceedings of the Commission since the last meeting was directed to be entered in the record for the day:

On Wednesday, March 13, the Commission left Tacoma in a special train on the Northern Pacific Railroad to visit certain mines on the line of that road, and visited those at Carbonado, Wilkeson, South Prairie, and Durham, spending the night at Palmer.

On Thursday, March 14, the Commission proceeded as far as Ellensburg, visiting on the way the mines at Roslyn, starting for Tacoma on their return the same night.

The Commission arrived in Tacoma at 7 a. m., of March 15, and at 7.45 started in the *Manzanita* for Port Orchard, where the day was spent at Point Turner in making a further inspection of the topography and in making borings of the soil. While thus employed, the *Manzanita*, with Commander Chester on board, visited Sidney and Port Madison to obtain information relative to the ownership of property and valuation thereof, returning to Seattle at night.

On Saturday, March 16, the *Manzanita* went again to Port Orchard. Captain Mahan, with Assistant Pratt, visited Lake Kitsap, 3 miles west of Point Turner, to ascertain its suitability as a source of water supply for a navy-yard.

Lieutenant-Commander Stockton resumed borings of the soil at Point Turner.

Commander Chester remained in Seattle, visiting the United States district attorney, William H. White, and made arrangements for the appointment of appraisers to assist the Commission in estimating the value of the navy-yard site under consideration. The appraisers appointed were W. H. Whitworth, of Seattle; A. H. Sroufe of Sidney; and Douglass A. Allmond, of Seattle.

The Commission spent Sunday, March 17, in Seattle, on which day a telegram was received from the Superintendent of the U. S. Coast and Geodetic Survey to the effect that he had authorized a survey for a navy-yard site by Assistant J. F. Pratt.

On March 18 the *Manzanita* started for Port Orchard, conveying, besides the Commission, the appraisers appointed to assist the Commission in estimating the value of the site under consideration.

The Commission now took under consideration the special observations made by it on the spot, and decided that Point Turner, on Sinclair's Inlet, in Port Orchard, possesses in sufficient degree the conditions necessary for the establishment of a navy-yard and docks; and also that, considering the hydrographic conditions, location, general surroundings, and capacity for local defense, it fulfills the requirements prescribed by the Navy Department in its letter of instructions dated November 30, 1888, better than any other site on Admiralty Inlet, Puget Sound, Hood's Canal, or Lake Washington.

The Commission next took under consideration Possession Sound, Port Susan, and Similk Bay as possible sites for a navy-yard, and decided that the hydrographic conditions and remoteness from the present centers of commercial activity, with insufficient communications, make them less eligible than Point Turner as a site for a navy-yard, and that, therefore, no further examination of the particular conditions at those places was necessary.

The Commission next took under consideration the main coast-line from Deception Pass to the Canada frontier, including the north and west shores of Fidalgo Island, and decided that the hydrographic conditions were inferior to those of Port Orchard; that the country was as yet imperfectly developed, with insufficient communications; that the coast was open to attack by sea unless specially fortified, which its present importance, irrespective of a navy-yard, does not demand; that it was, therefore, badly situated with reference to the principal lines of sea-coast defense as now required; also that the northern portion, including Bellingham Bay, from its nearness to the frontier, its isolated position, and the fitness of the surrounding country for military operations, was peculiarly open to a sudden raid by land, for all which reasons this region is inferior to Point Turner as the site of a navy-yard and demands no further examination.

The Commission next took up the San Juan Islands and considered them as a whole. It was decided that, while a number of available locations for fortified harbors or advanced stations for naval operations existed, their isolation and insular position, together with their liability to blockade, or interruption of communications in time of war, did not permit the selection of any of their fine harbors as suitable for a navy-yard.

The consideration of the harbors on the Strait of Juan de Fuca then followed, viz, Port Angeles, New Dungeness, Washington Harbor, and Port Discovery, which were also taken up as a whole.

It was decided that while each offered some advantages as a port, yet, without entering into their deficiencies, their situation without the limits where the outer

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*The Collector of the Port, New Orleans, La. :*

Please have the following delivered to Commodore McCann, president of commission to report on location for navy-yards on Gulf and South Atlantic coast :

Commodore WILLIAM P. MCCANN, U. S. Navy :

Department desires that the commission of which you are president cooperate with Governor Lowry, Jackson, Miss., and agree upon a time and place to commission to meet a commission appointed by Governor Lowry for conference regarding an examination of the harbors and bays of Pascagoula and Biloxi. Acknowledge telegram. Notify Department of time and place arranged for meeting.

B. F. TRACY,  
*Secretary of the Navy*

The subject of the comparative importance and advantages of different ports within the assigned limits of the investigation was discussed, and during the following week the Commission visited Hydrographic Office and the Coast and Geodetic Survey Office examining charts and plane table sheets of all the points under discussion. This careful examination and the elimination of places where the want of water put out of the question made it possible to reduce the number of places that it would be necessary to visit. There are certain conditions that are absolutely essential to a proper site for a navy-yard ; out of this number two may be taken, the absence of either or both of which is fatal to any proposed site. The first is a sufficient depth of water over the bar and in the channel up to the proposed site to admit of the heaviest ships at mean low water ; and the second is a fast land above high-water mark on which to erect buildings. In some cases, and in fact in most of the southern ports on our coast, the shoals are not naturally of a sufficient depth, and therefore nature must be assisted in her work of cutting across bars and deepening rivers. In some cases nature has done little for a port or is gradually filling in instead of cutting out, the expense of cutting and maintaining a channel will be so great as to throw such a point entirely out of consideration. No matter what the character of the land and surroundings might be when once inside, or the facilities for obtaining labor and bringing material to the place. After a careful and full discussion of all points it was decided that only the following-named places need be examined.

Port Royal, S. C., Sapelo Sound, Ga., and Brunswick, Ga., on the Atlantic coast ; while on the Gulf coast, Pensacola, Fla., Mobile, Ala., and New Orleans, La., were the only places that could be considered available. To this list Savannah, Ga., was added later by direct order of the honorable Secretary of the Navy, as was also by direction, at the special request of Governor Lowery of Mississippi, the harbor of Biloxi, Miss.

On February 23 the Commission adjourned.

On February 25 Capt. F. M. Ramsay was relieved from duty as president of the navy-yard site commission and Commodore W. P. McCann was ordered as president of the commission. The orders from the Department under which these changes were made are as follows :

NAVY DEPARTMENT  
*Washington, D. C., February 25,*

SIR: You are hereby relieved from duty as president of the navy-yard commission appointed under the Department's order of the 21st ultimo.

Respectfully,

W. C. WHITNEY,  
*Secretary of the Navy*

Capt. F. M. RAMSAY,  
*Commandant Navy-yard, New York.*

ncipally for stores and coal, at Port Royal, S. C., and Key West, Fla. There are  
o tracts of land purchased, but unused for naval purposes, at Algiers, La., oppo-  
e New Orleans, and on several islands along the coast of Georgia.

The Department understands, from the language of the act and from the public  
eussion attending its passage, that it is the wish of Congress to ascertain from the  
I report and deliberate decision of the commission of which you are president the  
st desirable location on or near the Gulf of Mexico for the principal naval estab-  
ishment of the United States south of Norfolk, Va.

This establishment is proposed to be for the repair and construction of naval ves-  
sels, to be duly provided with adequate docking resources and to be the important  
naval arsenal and depot for our naval forces cruising and operating in or near the  
Gulf of Mexico, the West Indies, and the Caribbean Sea.

In deciding upon this location, the Department wishes you to consider the general  
strategical requirements of such a naval station in this part of the United States,  
specially its bearing as a naval base for operations for guarding the mouths of the  
Mississippi and its water-borne trade, for the defense of the ports, coasts, and waters  
of the Gulf of Mexico, and for the protection of our trade and interests in the Car-  
ibbean Sea. The direct routes to the Central American Isthmus, and its probable  
ip-canal from the eastern coasts of the United States, it must be borne in mind,  
ss through the channels that lead out of or are near by the Gulf of Mexico.

The consideration of this phase of the question should also include the relative  
sitions of the various fortified naval ports of strong European powers, now exist-  
g, or to be established, in the West Indies, towards the location to be selected,  
ese ports being points from which hostile operations can be based against our trade  
d coasts.

In addition to these general requirements, due attention must be given to the fol-  
owing special requirements for a navy-yard:

- (1) A situation upon a good harbor, of sufficient size, depth, and accessibility for  
sels of the largest size and heaviest draught.
- (2) A favorable position with respect to the principal lines of defense.
- (3) A local security from water attack, due to position and natural surroundings.
- (4) Ample water frontage of sufficient depth and permanence and with currents  
moderate rapidity.
- (5) A favorable position with respect to the lines of interior communication (by  
d or otherwise) with the principal sources of supplies.
- (6) That the character of the ground shall be suitable for the construction of ex-  
cavated docks and basins and for heavy structures.
- (7) Proximity to centers of labor and supplies of material.
- (8) Healthiness of the climate and its suitability for out-of-door labor.
- (9) The existence, in the vicinity, of an ample supply of good potable water.

The Department therefore deems it advisable that the commission ascertain from  
e proper authorities of the War Department, for its consideration in this connection,  
e works in operation and the plans proposed or judged to be feasible for the per-  
ment improvement of the more desirable harbors coming within the geographical  
mits of your examination, and also the probable cost and results of such improve-  
nts.

In addition to the above information, the Department desires you to ascertain the  
ncipal lines of defense, as far as they are formulated, for the harbors and coasts  
thin the scope of your examination, and also to obtain any hydrographic or other  
formation that would be pertinent, from the Coast Survey or Hydrographic Office  
the Bureau of Yards and Docks.

The commandant of the navy-yard, Pensacola, Fla., and the commanding officers  
the naval stations at Key West, Fla., and Port Royal, S. C., will be instructed to  
ind you all possible assistance.

I am, very respectfully, your obedient servant,

W. C. WHITNEY,  
*Secretary of the Navy.*

Capt. F. M. RAMSAY, U. S. Navy,

*President of commission to select site for a  
navy-yard on or about the Gulf of Mexico, etc.*

In addition to the foregoing letter the following special instructions were received  
telegraph from the Secretary of the Navy.

Commodore W. P. McCANN,

*Navy-yard, Pensacola, Fla. :*

The Department desires that Savannah, Ga., be included in the places to be visited  
d reported upon by the committee of which you are president. While at Savannah  
u will confer with the authorities. Acknowledge.

B. F. TRACY,  
*Secretary of the Navy.*

*The Collector of the Port, New Orleans, La. :*

Please have the following delivered to Commodore McCann, president of commission to report on location for navy-yards on Gulf and South Atlantic coast :

Commodore WILLIAM P. MCCANN, U. S. Navy :

Department desires that the commission of which you are president communicate with Governor Lowry, Jackson, Miss., and agree upon a time and place for the commission to meet a commission appointed by Governor Lowry for conference regarding an examination of the harbors and bays of Pascagoula and Biloxi, Miss. Acknowledge telegram. Notify Department of time and place arranged for meeting.

B. F. TRACY,  
*Secretary of the Navy.*

The subject of the comparative importance and advantages of the different ports within the assigned limits of the investigation was fully discussed, and during the following week the Commission visited the Hydrographic Office and the Coast and Geodetic Survey Office, examining charts and plane table sheets of all the points under discussion. This careful examination and the elimination of places which the want of water put out of the question made it possible to reduce the number of places that it would be necessary to visit. There are certain conditions that are absolutely essential to a proper site for a navy-yard; out of this number two may be taken, the absence of either or both of which is fatal to any proposed site. The first is a sufficient depth of water over the bar and in the channel up to the proposed site to admit of the heaviest ships at mean low water; and the second is fast land above high-water mark on which to erect buildings. In some cases, and in fact in most of the southern ports on our coast, the channels are not naturally of a sufficient depth, and therefore nature has to be assisted in her work of cutting across bars and deepening rivers. In case nature has done little for a port or is gradually filling in instead of cutting out, the expense of cutting and maintaining a channel would be so great as to throw such a point entirely out of consideration, no matter what the character of the land and surroundings might be, when once inside, or the facilities for obtaining labor and bringing material to the place. After a careful and full discussion of all points, it was decided that only the following-named places need be examined :

Port Royal, S. C., Sapelo Sound, Ga., and Brunswick, Ga., on the Atlantic coast; while on the Gulf coast, Pensacola, Fla., Mobile, Ala., and New Orleans, La., were the only places that could be considered available. To this list Savannah, Ga., was added later by direction of the honorable Secretary of the Navy, as was also by direction, and at the special request of Governor Lowery of Mississippi, the bay and harbor of Biloxi, Miss.

On February 23 the Commission adjourned.

On February 25 Capt. F. M. Ramsay was relieved from duty as president of the navy-yard site commission and Commodore W. P. McCann was ordered as president of the commission. The orders from the Department under which these changes were made are as follows :

NAVY DEPARTMENT.  
*Washington, D. C., February 25,*

SIR: You are hereby relieved from duty as president of the navy-yard commission appointed under the Department's order of the 21st ultimo.

Respectfully,

W. C. WHITNEY,  
*Secretary of the Navy.*

Capt. F. M. RAMSAY,  
*Commandant Navy-yard, New York.*

NAVY DEPARTMENT,  
Washington, February 25, 1889.

SIR: In pursuance of the act of Congress approved September 7, 1888, a copy of which is herewith inclosed, you are, in addition to your present duties, hereby appointed president of a commission, to consist of Capt. Robert Boyd, Lieut. Commander Willard H. Brownson, and yourself, "to report as to the most desirable location on or near the coast of the Gulf of Mexico and the South Atlantic coast for navy-yards and dry-docks."

You will proceed to Washington and report, in person, at the Department for this duty, after which you will, with the commission, visit such points on or near the coast of the Gulf of Mexico and the South Atlantic coast of the United States as it may deem advisable for the proper execution of this duty.

The report of the commission will be as full as practicable, and will contain all the information in detail obtainable in reference to this subject which may be of interest to this Department or to Congress.

Respectfully,

W. C. WHITNEY,  
*Secretary of the Navy.*

Commodore W. P. McCANN,  
*Commandant Navy-yard, Boston, Mass.*

In obedience to the following order, Lieut. Duncan Kennedy, U. S. Navy, reported for duty as secretary of the commission.

NAVY DEPARTMENT,  
Washington, D. C., March 2, 1889.

SIR: In addition to your present duties you will report to Commodore W. P. McCann, for duty as secretary of the commission of which he is president, appointed for the purpose of reporting as to the most desirable location on or near the coast of the Gulf of Mexico and the South Atlantic coast of the United States for a navy-yard and docks.

You will accompany the commission to such points as it may visit in connection with this duty.

Respectfully,

W. C. WHITNEY,  
*Secretary of the Navy.*

Lieut. DUNCAN KENNEDY, U. S. Navy,  
*Navy Department, Washington, D. C.*

WASHINGTON, March 11, 1889.

The Commission met at the Navy Department. Present, Commodore W. P. McCann, Capt. Robert Boyd, Lieut. Commander Willard H. Brownson, members, and Lieut. Duncan Kennedy, secretary.

The question of the route to be taken was discussed and settled, and after collecting charts and other material that would be useful to the Commission during the course of its investigations, on Wednesday, the 13th March, the Commission started for Beaufort, S. C., where the light-house tender *Wistaria*, which had been placed at the orders of the Commission by the Light-House Board, was to meet them. The Commission arrived at Beaufort, S. C., on the evening of the 14th, and on the morning of the 15th proceeded in the *Wistaria* to examine different points in and about Port Royal Sound with reference to their suitability as locations for a navy-yard.

The Commission desires to express its appreciation of the cordial cooperation of Lieut. Commander R. D. Hitchcock, U. S. Navy, light-house inspector, which enabled them to make the examination of the Atlantic coast under the most favorable conditions.

The Commission also desires in this connection to express its appreciation of the marked attention with which it was received by the State and local authorities everywhere, and to state that they had extended to them every aid and facility in carrying on their investigations of proposed sites for the establishment of naval stations, and that much

valuable information and data was obtained by the Commission in conferences with the authorities and leading business men of the port cities which were visited.

The Commission having completed its examination of the southern ports returned to Washington, and the following report was made to the honorable Secretary of the Navy:

NAVY DEPARTMENT,  
Washington, D. C., April 8,

SIR: I have the honor to inform the Department that the Navy-yard site commission, having completed its examination of the South Atlantic and Gulf ports with reference to the location of navy-yards and dry-docks, has returned to Washington.

Before completing its report it will be necessary to wait for about one month to receive estimates for docks, dredging, and cutting out the bars and channels of the topographical survey at Pensacola, and borings at other localities. While waiting for this data Captain Boyd and myself return to our stations and Lieutenant Commander Brownson and Lieutenant Kennedy will remain at Washington to report and act for the commission.

I have directed the members of the commission to re-assemble here when they proceed with the work on the final report.

I have the honor to be, sir, very respectfully,

W. P. McCANN,  
Commodore, U. S. Navy, and President of the Navy-Yard Site Commission.

The great and radical changes in the art of naval warfare which have been brought about in late years by the introduction of iron-clad ships, high-powered long-range guns, torpedo-boats, mines, and steamers have most materially altered the conditions which must be fulfilled before any site can be considered as suitable for a navy-yard. A first requisite there must be a depth of water sufficient to admit the heaviest vessels at all times, for it is not difficult to imagine a vessel seeking the harbor as a place of refuge when hard pressed, when delay outside would be fatal; or ships might be inside waiting for the tide to rise so that there would be sufficient water on the bar to permit their going to sea, and in the mean time the enemy, possibly that it was the intention to attack, has sufficient time to collect his forces if desired, or to move rapidly away if he prefers, while all the time the ships that might do so much are cooped up helplessly inside, unable to stand a blow.

Sites that were well suited for the purposes of navy-yards some thirty or forty years ago are, many of them, out of the question now, for the reason that they are too near the sea. While it is very true that accurate rate shooting can not be done at the extreme ranges of the high-powered guns, and therefore that ships would never think of engaging at extreme range, it must not be overlooked that a navy-yard presents a fairly large target, and though the actual injury inflicted by a bombardment might really be very slight, still the fact that it is liable to such bombardment would sadly demoralize the laborers, interfere seriously with work, and some lucky shots might happen to inflict most serious injury to machinery, the plant in general, or to vessels in the yard.

The primary use of a navy-yard is the construction and repair of ships. As necessary sequences of this it follows that the location must be suitable to construction in all departments, and this again necessitates such soil as will admit of the construction of building-machine-shops of the largest size, fitted with the heaviest machinery, forges, foundries, boiler shops, gun parks, etc. Store-houses must also be provided for the collection of stores in large quantities, so that in case of war and the necessity of fitting out a large number of ships with the greatest expedition there may be no unreasonable delay.

list, which is but a very imperfect one, must be added quarters for messes, barracks, and guard-houses for sailors and marines, and many other buildings, all of which together will cover a large amount of ground, and must be well removed from any chance of molestation by the enemy.

Not only does a navy-yard represent years of labor and an immense outlay of capital, but it contains materials and stores which are absolutely necessary for the carrying on of a maritime war. Its destruction during such a war would be a disaster that could not be counted in dollars and cents, for not only would it most seriously cripple the Government, and be impossible to replace while the war continued, it might also have a most disastrous influence on the results of the

one of the primary conditions of a good site for a navy-yard is, therefore, that it should be so situated as to be secure from attack either by sea or land. The immunity from attack by sea should be the result of position if possible, rather than due to extensive fortifications alone, although the fortifications will always be needed to assist in the protection of the navy-yard, most especially from attack by water. This necessity of fortifying the actual locality, as well as the headlands and roaches by water to dock-yards is fully recognized by foreign governments. The defense of the dock-yards at Chatham and Portsmouth, England, in addition to the outer lines of defense, are described as the most elaborate in the kingdom. The heights surrounding the former are crowned with batteries, while the banks of the Medway, for a distance of

miles to the estuary of the Thames, are studded with batteries and redoubt stations, and are regarded as being unassailable. Such is the protection given to a dock-yard by a power well prepared to defend its approaches by battle-ships alone. Our military authorities assure us that we have little to fear from a descent on land.

The geographical and strategic position must have the greatest weight in electing the locality for a navy-yard. It may happen, as is really the case in the Gulf of Mexico, that there are three or four places that are so nearly equally distant from some particular point or points that it is difficult to be guarded, that it is immaterial which one is selected; in this case local peculiarities will alone settle the question. But as the case stands with us, having navy-yards on our Northern Atlantic coast, one on the Southern coast, and but one on the Gulf coast, and that the latter is allowed to fall into decay, it follows from a careful study of the geographical situation that we should have a navy-yard somewhere about half-way between Norfolk and the Florida Straits, and another in the Gulf of Mexico. Much can be said in favor of a yard on either coast, and the selection of the one and the rejection of the other should be done hastily, nor till all questions have been most carefully considered.

On the Atlantic, we have a long stretch of coast on which there is no place where a man-of-war can run in and find a supply of ammunition, a place for her, where she can find material and men all ready to make repairs that an action or the exigencies of active service may make absolutely necessary and indispensable, or where she can be docked, a place possibly most important of all, no point of rendezvous for a squadron, that it might be the intention to collect for operations in the West Indies. For all such work in the Bahamas, on the eastern end of Cuba, San Domingo, or among the Windward Islands, some point on the Atlantic coast would have great advantages over one in the Gulf from the fact that it would be nearer the field of operations, and vessels

would not lose so much time in returning to port for ammunition, coal, or repairs. In the event of war with a foreign power that had any commerce with the West Indies or to the Isthmus of Panama, some point on the Atlantic would make an excellent base from which to send out vessels or squadrons to break up such commerce. It is true that to a number of points among the islands, the distance from some point on the Gulf would be less than from an Atlantic port, but it will be well to note that all vessels starting from the Gulf must, of necessity, pass through the Yucatan Channel or the Florida Straits as through a gate, and an enemy could lay in wait for them at these points, knowing that there was no other way for them to go. On the other hand, there would be no means of determining beforehand what direction a fleet starting from an Atlantic port would take, and a slight détour might throw the enemy completely off the track and permit the delivering of a blow on the enemy's commerce entirely unopposed.

With regard to the question of the selection of some point on the Gulf as a site for a navy-yard, the reasons in favor of it are many and conclusive. At the present time the commerce of the Gulf is enormous, and it is increasing all the time. The timber trade at Pensacola, the timber and iron trade at Mobile, and the cotton and general trade at New Orleans represent no insignificant portion of the trade of the United States, and most earnestly demand adequate protection. It is evident that such protection cannot be given if we have no navy-yard in the Gulf at which we can readily fit out our vessels, which can be used as a rendezvous for our fleets, and to which they can retire if an overwhelming force is opposed to them. In such an event a navy-yard on the Atlantic coast would be of little value. If we were at war with England she would have Jamaica from which to strike the blow; while if the fight were with Spain Cuba would form a base of operations that would be closer to our Gulf-ports than any point we have on the Atlantic. With the cutting of a transisthmian canal, it matters little in this connection whether it be at Panama or Nicaragua, questions are sure to arise that will involve the United States, and we must be prepared to maintain our rights with force; all nations that are interested in this question are likely to be jealous of us, if for no other reason than our near neighborhood to the locality, and we must put ourselves in a position to maintain our rights, which can only be done by having a naval force that can be made available at short notice. England, France, Spain, Holland, and Denmark have all dock-yards and coaling stations in the West Indies, any one of which stations is a shorter distance from either the Panama or the Nicaragua Canal than any port in our possession.

The cutting of a canal at either of the points named would doubtless have a great effect on our commerce, both between the Pacific and the Atlantic coasts and between the Gulf and the west coast of South America and the islands of the South Seas. Such commerce must pass through the Yucatan Channel, where we have Spain in the Island of Cuba on one side, and the English in the Island of Jamaica almost in the line of travel. Such a position is one of weakness for us and can only be offset by our being prepared to protect our rights, and to accomplish this, a navy-yard in the immediate vicinity, ready prepared as a base of operations, is absolutely necessary.

The geographical and strategic questions will decide the general locality in which it is best to locate a navy-yard, but minor local questions will have to be carefully studied before the particular spot can be decided upon. These points are in many ways far more difficult of solution than the more general ones. As regards our own Southern coasts

only a slight study of the charts is necessary to convince the most casual student that there is no point that combines within itself all the requisites for a perfect navy-yard site. It therefore becomes necessary to study the various features of many places and endeavor to determine which one combines within itself the greatest number of good points and the smallest number of drawbacks.

In the study of the relative values of various sites that may be brought forward as suitable for navy-yards, one of the first points to be considered is the depth of water. In this respect the United States is peculiarly situated. Generally speaking, the approaches to our ports are shoal, and vessels of great draught can not find entrance even at high tide. This hydrographic peculiarity has forced upon the Government the construction of vessels of moderate draught, and in no construction policy that has yet been discussed have vessels of over 24 feet draught been seriously considered.

However, the building of coast-defense vessels and battle-ships of a greater draught than 24 feet will soon be forced upon us, and if a construction yard is to be established in our southern harbors the bars and channels must be deepened and straightened to render them practicable for the increased and increasing size of armored ships.

Closely allied to this question of depth is that of ease of entrance. As in war times it may not infrequently happen that the buoys are removed in order to prevent an enemy forcing his way in, it may also happen that at the same time one of our own ships is trying to enter. If the channel is reasonably straight, a vessel familiar with the ground could enter in safety; while if the channel were very intricate, there would be no possibility of safely passing through.

Once inside, the character of the holding ground, the extent of the water basin, the liability to sudden and heavy gales, the protection afforded by the surrounding land, are all points that must receive careful consideration. Ordinarily speaking, the gales on our coasts are not of such severity that a vessel anchored in a harbor need fear breaking adrift. With men-of-war of the present day, with their small amount of top hamper, there is still less likelihood of any trouble on this score; but as the ships will ordinarily lie out in the stream, the general character of the weather is of interest as regards boating. The record of gales as kept for the last seventeen years by the Signal Service shows that on our southern and Gulf coasts the average velocity of the wind during the heaviest gales is only about 35 miles per hour.\*

An important point in the selection of a navy-yard site is the extent of the immediate water front, both close alongside the wharves and off in the stream, where vessels must lie when not needed at the wharf for repairs, or to take in coal, ammunition, etc. A restricted water front would be a serious inconvenience in case it were necessary to fit out several vessels at the same time, and, if possible, all such impediments to rapid work should be avoided. Deep water off the yard is also a necessity, in order that it shall be possible to move vessels at all stages of the tide.

When these requirements have all been found, and it is safe to say that they can not all be found in any one of the ports on our southern coast, it is necessary to study the location with reference to its interior lines of communication and the facility with which material can be obtained and transported to the shops for immediate use. The railroad facilities of the country are so extensive that but few places will have to be

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(\*See Appendix D.)



thrown out of the count on this score, though one or two in the ( which otherwise would be very desirable are entirely out of the question, notably Tampa. The leading seaboard cities of the South are connected by rail with the coal and iron fields of Alabama, and to all them material of all classes could be brought with but little delay.

After a careful study of the general features of a proposed locality the next point naturally is the study of the particular spot of ground which may be thought suitable for a Government establishment. In the present day of steel ships the necessity of dry-docks is greater than ever. For many years, even with coppered wooden ships, we have the want of dry-docks, and now that we are constructing a navy of vessels that must be docked very frequently if they are to be kept in servicable condition there must be facilities for keeping the bottoms clean and well painted, and this can only be done by taking the vessels out of the water at comparatively short intervals. It has been found by experience in all navies that an iron or steel vessel which has been in the water for three or four months loses very much of its speed, oftentimes as much as 25 per cent., so that by the end of six months the amount of coal consumed if maximum speed is to be maintained, and oftentimes this will be an absolute impossibility, would at least be for the cost of docking, and perhaps something over. The loss or fouling in any vessel where the bottom is foul is so well known that it is hardly necessary to allude to it; but the rapidity with which all kinds of marine growths accumulate on the bottoms of all steel and iron vessels is not so well known, but all the same it emphasizes the necessity of having navy-yards and good docking facilities at various points where they may be available to all our cruising vessels without their steaming a long distance to find them.

The present naval dry-docks of the United States are, with three exceptions, made of granite. The exceptions noted are the new docks at New York, League Island, and Norfolk. Until recently granite was the sole material used in the construction of such docks, but it has now been demonstrated that dry-docks of wood are almost two-thirds cheaper and are really more lasting and less costly to keep in repair than those constructed of granite. Naval Constructor Hichborn, in his able report on European dock-yards, says:

Wooden docks cost from 30 to 50 per cent. less than those of stone, and in all cases where they are exposed to severe frosts are much cheaper in maintenance; extensive repairs are not required within the first twenty years.

The following extracts from the letter of Commodore Harmony to the Committee on Naval Affairs on the subject of dry-docks are of interest and value in this connection. He says:

My proposition to build docks of timber is based upon the fact that they can be built at such a small price, comparatively. Another very serious objection to the present docks is the fact that their sides are almost vertical, and in cloudy days, or so dark at the bottom of the dock as to make efficient work almost impossible. In the Simpson dock this objection will be avoided by building them so wide that a person standing on the coping of the dock can see under the bottom of the vessel, and thus giving light enough so that efficient work can be done on the bottom of the vessel even in the dulllest of days. A look at the dry dock at the New York navy yard, and also at the Simpson dry-dock in the basin at Brooklyn, will at once convince any one of the advantages of the latter plan. There is every reason to believe that a dock constructed of timber will last for centuries with proper care; in case a piece of timber being found rotten it will be as easy a matter to replace it as to take a defective plank out of a ship and put in a sound one.

The principal advantages which timber docks possess over steel docks as usually constructed are greater accessibility, better access for shoring vessels, better distribution of light, and dryness.

The narrow altars and gently sloping sides afford safer and easier means of ingress and egress at every point, furnish a better supply of light and air, and the shoring is more easily adjusted, all of which materially aid in the dispatch and economy with which work of repairs can be prosecuted.

In most of our southern cities there has always been considerable difficulty in procuring an ample supply of unobjectionable drinking water. A serious had this matter become that in many places, as the cities increased in size, great fears were entertained on the score of possible extensive conflagrations, and at times, during periods of prolonged drought, there would be also the fear of water famine, and the inhabitants were obliged to depend upon cisterns and private wells. During the last few years, however, most of the southern cities of any importance have begun a systematic use of artesian wells, and wherever this has been done the water supply is practically unlimited and inexhaustible. In some places on the Atlantic the water thus obtained has a very decided sulphurous taste and smell, but this usually disappears after a short exposure, leaving the water pure and palatable. The universal success of these wells makes it almost certain that at any place where a navy-yard may be established there will be no difficulty in obtaining any required amount of good, potable water. At all places visited by the commission artesian wells were in use, and some, as at Savannah, Pensacola, and Mobile, the entire city supply drawn from this source.

The healthfulness of any locality should be carefully considered before deciding upon its fitness for the site of a navy-yard. On the southern coasts the land is generally low and swampy and there is great difficulty in finding a place that will be free from low, malarial fever, while most of the places are more or less subject to periodic visitations of yellow fever. The Commission is indebted to Surgeon John W. Ross, U. S. Navy, for much valuable information on the subject of yellow fever and the healthfulness of the Gulf ports in general. Dr. Ross also forwarded letters and statistics from the leading medical men of Pensacola, Mobile, and New Orleans. All these medical men seem to be unanimous on one point; that is, that yellow fever does not naturally belong to the Gulf coast of the United States, but is always imported, and that, with proper quarantine regulations and a careful observance of good sanitary rules and regulations, it can be excluded almost absolutely, and by carefully isolating the cases that do succeed in running the quarantine an epidemic of yellow fever can be prevented. The following conclusion is quoted from Dr. Ross's letter:

Looking at Pensacola, Mobile, and New Orleans from a sanitary point of view, there does not seem to be any important difference between them as sites for a navy-yard. Their respective pros and cons about counterbalance one another. There does not seem to be any objection that could logically be made to any one of the places mentioned upon the score of unhealthfulness. The time is fast approaching, if it has not already arrived, when yellow fever will be as effectually barred out of Pensacola, Mobile, and New Orleans as it has been from Norfolk and Philadelphia. Malarial fever, the great curse of the South, West, and many parts of the North, may be shorn of nearly all its terrors by the proper observance of a few long known and well-established precautions, such as sleeping in upper stories, thorough drainage, etc.

In deciding upon a site a place should be chosen where the prevailing wind does not blow across any fresh-water marsh, but comes in directly from the sea. The presence of fresh water in any quantity would be advantageous in facilitating the construction of fresh-water basins in which to lay up steel ships, but it may make a place so un-

healthy as to preclude its acceptance. The southern climate is sufficiently temperate, even during the winter months, to admit the carrying on of out-door work, and during the summer the average temperature is not so high as to prevent out-door work by those who are acclimated. None of the ports are ever closed by ice, so that on this score at least there will be no difficulty in entering at any time.

There are but few, if any, southern ports in which it will not be necessary to carry out extensive dredging, and at places where this is not necessary the difficulty of finding fast land on which to put up heavy structures is often so great as to place such a point beyond consideration.

Such, in brief, are the conditions deemed essential to a good site for a navy-yard, and it has been the endeavor to apply them carefully and dispassionately to the various points under consideration, and to discover, by a careful and exhaustive examination of all the surroundings, what point combined in itself the nearest approach to all the desired requisites. Owing to the magnitude and importance of the question involved and to the fact that substantially the same question has received much attention of late years at the hands of successive boards of distinguished officers, your commissioners have undertaken the examination of the subject with much diffidence, and have not hesitated to make use of the very valuable information collected by those who before them have given this subject most careful study. In the detailed consideration of the various ports all the subjects already noted in a general way have been most carefully and extensively gone into, and information from all possible sources has been sought and used in the study of this most important question.

#### PORT ROYAL, S. C.

The geographical position of the superior harbor of Port Royal, midway between Norfolk and Cape Florida, or about the middle of the southern Atlantic coast of the United States, with its well-sheltered, safe anchorages in the sound, and on the Broad, Colleton, and Beaufort Rivers offers unparalleled advantages on this coast for the establishment of an important naval station. This harbor is well known, and its value as a naval station was fully appreciated when it was occupied by Rear-Admiral Dupont in 1861. The entrance is comparatively easy, and though at the present moment there is not as much water on the bar as is desirable, still it has more water than any other point on the southern Atlantic coast except Sapelo Sound, which latter place offers no other advantage, and vessels once inside can ride in safety in deep water in the sound and in the adjacent rivers, while its size is sufficient to afford free movement to all vessels, even the very largest.

The absence of facilities for docking and equipping naval vessels on the long stretch of coast between Norfolk and Pensacola, a distance of 1,440 miles, has already been seriously considered by the Department and recognized by official boards authorized to report on this subject. Port Royal is about 480 miles from Norfolk, 960 from Pensacola, and 450 from Key West. As regards communication with the West Indies, Port Royal is 480 miles nearer to the Bahamas than Pensacola, while the distance of the two places from Havana is the same. As a point from which to communicate with the Windward Islands, Port Royal has the advantage over Pensacola or any other Gulf port. The geographical position of Port Royal, nearly midway between the cities of Charleston and Savannah, explains why it has hitherto been neglected,

the larger places completely overshadowing it. These cities, so long as small vessels were used for foreign commerce, were amply sufficient for all wants; but now, when vessels of greater size and draught are common, a deeper harbor is required, and in this particular Port Royal is far superior to its neighbors. The vast net-work of railroads that lead from the South and West and have their outlet at Brunswick, Savannah, and Charleston could easily be directed to Port Royal, to which point at the present time there is but one railroad, the Port Royal and Augusta Railroad, connecting with the Charleston and Savannah Railroad, and through it with the interior.

The bar 10 miles distant from the entrance has a least depth of 21 feet at mean low water, and would require but little expense to straighten and deepen it for the entrance of the larger class of vessels at low water. In consequence of the great size of Port Royal Sound, Broad River and its tributaries, the mean rise and fall of the tides being 6.7 feet, the currents are moderate, and there is little filling in or shifting of the bar due to local action, or to the bringing down of any deposit by the rivers flowing into it. The most serious objection is the character of the land on the water front, it being mostly sandy, low, and in many places swampy. The climate of Port Royal is an important element in its favor. It is well north of the frost line, which in itself would aid greatly in excluding or at least stamping out yellow fever should it by any chance be introduced, while at the same time the weather is never so cold, nor ice and snow so abundant, as at any time to prevent out-door labor.

The forests of yellow pine and other timbers suitable for the construction of docks, basins, and for building purposes in this State are practically inexhaustible, near at hand, with ample facilities for transportation by land or water, while the vast coal fields and iron mines of northern Alabama are accessible by the system of railroads connecting Port Royal with every part of the country.

The channels and shores of Broad, Colleton, and Beaufort rivers were carefully studied; favorable conditions of both land and water could be found on Colleton River and Neck, but the location on that side of the Sound is objectionable for want of ready communication by rail with the mainland, and for the further reason that such a locality would present no good points that can not be found at the site of the present naval station.

From Archer Creek to Habersham Creek the land is low, swampy, and intersected with numerous small creeks, the best land being a considerable distance back from the water's edge. The point just above Habersham Creek is fast land, well wooded, and, compared to the adjacent lands, high, but at this point the broad, deep channel of Broad River becomes narrow, shoal, and intricate, and would require extensive dredging and cutting to make a suitable water front for a navy-yard. This point bears a little south of west from Beaufort, distant about  $5\frac{1}{2}$  miles, and is  $3\frac{1}{2}$  miles from the nearest point of the Port Royal Railroad. There are no houses nearer than between 1 and 2 miles of this point, and there is little good potable water here at present, but judging by wells that have been dug in the vicinity, and more particularly by the artesian wells that have been bored in the neighborhood of Port Royal, the naval station, and many other points in the south, there is not the least doubt that good potable water in almost any amount can be obtained from inexhaustible wells.

The banks of the Chechessee River are low and swampy and not suited for the purposes of a navy-yard, while on Colleton River, though

fast land can be found, the channel from Port Royal Sound is very intricate and abounding in shoals, while the water front would be so restricted as to be a very serious inconvenience. The same system of defenses that would protect any one point in Port Royal Sound would serve almost equally well for all other points in the neighborhood, and as the present site of the naval station is well inside the outer line of defenses, it does not seem as if any other point offered superior or equal advantages. The examination of Beaufort River and the land about the naval station at Paris Island proved more satisfactory. This position is 5 miles below Beaufort, 6 from Bay Point, and 15 from the outer bar. Twenty-one feet is found at the end of the wharf at the naval coal depot and 24 feet in the channel off it, admitting the heaviest draught vessels at high tide, and but little dredging would be required at one or two points in the channel of Beaufort River to render it accessible at low water or to deepen it to 25 feet. This position offers a far more suitable site for docks and a depot of supplies than any other point examined inside the headlands, and it could be successfully defended by an inner line of fortifications on Paris and St. Philip's Islands, in addition to those that might be established on Hilton Head and Bay Point. The naval station being near the terminus of the Port Royal and Augusta Railroad could be easily connected with the whole railroad system. The distance from Port Royal to Charleston, S. C., is 88 miles; to Augusta, Ga., 112 miles; to Birmingham, Ala., 450 miles.

The Army engineers have, up to the present time, made no examination or survey of the entrance to Port Royal Sound with a view to ascertaining the practicability of improving the navigation. The present channel depth of 21 feet has, with a tide of 6.7 feet, satisfied all demands of commerce at this locality. No information is obtainable from which an opinion can be formed as to the permanency of dredging in the part of the river below Battery Creek. No project for the defense of this port has been elaborated up to the present time. The protection of a navy-yard situated at the present naval station on the east side of Paris Island would involve neither serious engineering difficulties nor excessive cost.

The amount of land owned by the Government on Paris Island the site of the present naval station, is too small for the establishment of a navy-yard and repair station; but from information furnished by the auditor of Beaufort County, S. C., land in the immediate vicinity can be purchased at reasonable rates. The auditor informs the Commission as follows:

Lands in the neighborhood of the naval station are assessed at from \$2 to \$6 per acre, the latter being for arable lands. These rates have prevailed for years, but can not be considered as a fair estimate of value, which is sometimes trebled on adjoining small tracts, due entirely to the situation. The usual taking price for lands (agricultural) are from \$5 to \$15 per acre, the long prices prevailing where long time is given.

Much depends upon who owns the land and circumstances of sale. The bulk of it is in small tracts, owned by negroes, who do not care to sell if any one wants to buy, not even at prohibitory prices; but when they do sell, it is generally at a figure below the actual value.

The Commission, considering this point an eligible site for a dry-dock and repair station, caused examinations to be made with a view to ascertaining the practicability of constructing a timber dry-dock. The following is a summary of the results as obtained by Messrs. J. E. Simpson & Co. The borings were made with a 2-inch pipe, and the results compared with those obtained by Lieut. C. H. Lyman, U. S. Navy, in boring for a 6-inch pipe well at a point 300 feet south and 50 feet west

of the point where borings for a dock were made. The borings showed at top for 5 feet sandy loam; for the next 11 feet, bright light-blue clay slightly mixed with sand, stiff and solid; for the next  $9\frac{1}{2}$  feet, fine gray sand mixed with clay; for the next 6 feet, oyster and mussel shells with fine sand; for the next  $4\frac{1}{2}$  feet, sand and black mud. At this depth (36 feet) phosphate rock was encountered, though at this point it is a mere shell, being less than 1 inch in thickness.

From 36 to 39 feet was found clay of an india-rubber like tenacity, almost impossible to drive through. In driving into this stratum the hammer would rebound after striking the pipe. From 39 feet to end of pipe (40 feet 6 inches) same clay, mixed with sort of sandstone particles.

Diligent investigation developed the fact that phosphate rock varies considerably in thickness, the maximum being 15 inches. On the part of Paris Island where the investigation was made the rock is thin. The clay noted as being so tough, hardens like stone, and contains some phosphate. Underlying this clay is a sand-mixed stratum, resembling stone, which is claimed (and is proved by artesian well-borings) to extend some 100 feet in depth, and in several instances the boring and pipe are only run to this stratum. Phosphate rock and the like accompanying strata underlie a large area of surrounding country.

None of the destructive effects of the *teredo* are apparent at this place; but some of the pile structures show evidences of the existence of the *limnoria*, and it would be necessary to creosote the timber exposed always to the tide-water.

As a result of their investigations, Messrs. J. E. Simpson & Co. are of the opinion that a timber dry-dock of the same dimensions as those now being built for the Government under similar specifications could be constructed within thirty-six calendar months for the approximate sum of \$675,000.

The Commission would therefore recommend the establishment of a dry-dock, depot of naval supplies and coaling station on Paris Island, right bank of Beaufort River, South Carolina, at the site of the present naval station.

A chart of Port Royal Sound and entrance is appended and marked E; also a plan of the naval station, marked F; and a plan showing location of borings, marked G.

#### SAVANNAH, GA.

The following information relative to the port of Savannah has been furnished the Commission by the Board of Engineers, U. S. Army, of which General H. L. Abbot is president:

The works for the improvement of navigation between the ocean and the city of Savannah, begun in 1873, have been confined to the river and Tybee Roads; for the depth of water there has always been less than on the outer bar, where 16 or 17 feet is found at mean low water. The object of the improvement has been to carry this depth to the city. In 1873, before the work of improvement upon the present plan was inaugurated, the usual draught of vessels navigating the river at high tide was 14.5 feet. The mean rise and fall of the tide at Savannah was 6.7 feet and at the mouth of the river 7 feet.

The plan of improvement under which operations have been carried on up to the present time provides for the establishment of a channel from Tybee Roads to the city of Savannah, practicable at high tide for vessels drawing 22 feet of water and the widening of the channel of the river opposite the city to 600 feet, of uniform depth with the balance of the channel. The cost was originally estimated at \$482,000, and as amended and enlarged at \$1,212,000.

In the report of the Chief of Engineers for 1888 General Gillmore, in submitting the results of an examination and survey made by the assistant, Lieut. O. M. Carter, with

a view to obtain 28 feet at high water (21 feet at mean low water) from Cross Tides above Savannah to the sea, presents in outline a project and estimate of the cost, the latter being \$6,660,000. This project has not been formally acted upon by the Engineer Department, but from it the inference is legitimate that the cost of obtaining a depth of 25 feet at mean low water would be enormous, if indeed it be practicable at any expense. Even to obtain a depth of 21 feet (28 feet at high water) General Gillmore states: "The tidal section of Savannah River will need to be, in great measure, canalized, in order to maintain the greatest channel depth of which it is capable, and yearly dredging will probably be necessary."

The Board on Fortifications and other Defenses of 1885 recommended for this port three 12-inch guns, six 10-inch guns, four 8-inch guns, sixteen 12-inch mortars, and 300 submarine mines. Satisfactory sites of the batteries, etc., are available. The estimated cost was \$2,243,000. No attempt to make Tybee Roads a safe anchorage for vessels was contemplated, but it will be forbidden to the enemy.

Under the direction of Lieut. O. M. Carter, Corps of Engineers, who kindly consented to attend to the business for the Commission, five borings were made at Savannah to ascertain the character of the sub-soil and its suitability for making excavated docks and sustaining heavy structures. The borings were made at two different points; three at Deptford Plantation, near Fort Oglethorpe, and the other two at Hutchinson's Island, opposite the city of Savannah. The result of these borings seems to show that the ground is of a character to support the various heavy structures that would be required at a navy-yard. A diagram of the soundings is appended, marked I.

The report of the health officer, prepared for the Commission in April, 1889, states that while Savannah has increased in population since 1879, the actual deaths have decreased, not only as to the annual ratio per thousand, but in the actual number of deaths. The annual ratio per thousand for that period, 1878-'79, is given as follows:

Savannah, Ga. ....	13.69	Pensacola, Fla. ....	14.56
New Orleans, La. ....	27.44	Charleston, S. C. ....	27
Mobile, Ala. ....	18.75	Wilmington, N. C. ....	24

(This table is copied from the "Sanitary Era," a magazine published in New York City, and said to have no local interest in any Southern city.)

The Commission visited the locations on the river in the steam yacht belonging to the Engineer Department, which was kindly placed at their disposal by Lieutenant Carter, and also viewed Deptford from shore side.

It is evident, from the information furnished by the Board of Engineers, that these officers do not consider it possible to secure and maintain a channel of 25 feet depth at mean low water, which depth the Commission considers an absolute necessity. Furthermore, in the opinion of the Commission, the land which is reclaimed swamp land and very low, is not suited to the purposes of a navy-yard. This fact, taken in connection with what has already been said about the lack of deep water in the channel, renders a further consideration of this harbor as a site for a navy-yard unnecessary.

A chart of Savannah is appended, marked II.

#### BRUNSWICK, GA.

Extracts from the Report of the Chief of Engineers, U. S. Army, 1888.

About 2 miles above the city of Brunswick the Turtle River is divided by Buzzard's Island into two branches, the smaller one flowing to the eastward of the island, and upon which the city of Brunswick is situated, being known as East River, the other retaining the name of Turtle River. These streams unite again about 1½ miles below the city to form Brunswick River. The lower part of East River forms what is known as the harbor of Brunswick.

Turtle and Brunswick rivers have low-water depths of from 4 to 6 fathoms. Over the shoals in front of the city there was, till the improvements had been carried out, a low-water depth of only 9 feet. The *teredo* is found at Brunswick. Much of the wood-work used in the channel work was almost destroyed by the *teredo*. In June, 1887, the minimum low-water depth was 14 feet. No work was done during 1888, and consequently the channel is now only 11.5 feet deep, and has narrowed, and in some places shoaled, to 7 feet. Great shoaling has also taken place along the city wharves.

The present project for the improvement of this harbor was adopted in 1880, and modified and enlarged in 1886, the object being to secure a navigable channel of not less than 15 feet depth at mean low water. The cost of the project of 1880 was estimated at \$73,187, and, as enlarged in 1886, at \$190,000, inclusive of appropriations already made. The total expenditures to June 30, 1888, including all outstanding liabilities, were \$92,463; amount appropriated in 1888, \$35,000; amount (estimated) required for completion of existing project, \$62,500.

A further consideration of this harbor for a navy-yard site is, in the opinion of the Commission, unnecessary.

#### SAPELO SOUND, GA.

The Commission inspected Sapelo Sound in the light-house tender *Wistaria*, passing up beyond the entrance to Mud River. There is ample depth of water both at the entrance and in the Sound, but no fast land, the mud banks and swamps, mostly covered at high tide, extending a mile or more back from the water's edge. Further comment on this place is considered unnecessary.

#### KEY WEST, FLA.

The most advanced post that the United States possesses in the Gulf is Key West. This point, thrust well out towards Cuba, guarding one of the two exits from the Gulf and the one through which the greater part of our commerce passes, is of the greatest importance, and it would be hard to conceive of a greater blow to our power in the Gulf than its loss; unfortunately, however, it is not so situated as to be well and easily defended. Being on the Florida Straits, only 5 miles from the deep water of the Gulf Stream, it is practically the key to the Gulf, and also controls much of the West India trade, consequently its possession is of inestimable value. During any maritime war in which the United States might be engaged Key West and the Tortugas held by our naval forces would insure the safety of our trade in that quarter, while, if in the possession of an enemy, the destruction of the trade would be certain. The holding of Key West is a military necessity, for, in connection with the Tortugas, it forms a naval base, natural and advanced, for any operation offensive or defensive in relation to Havana, the Island of Cuba, the Bahamas, or the West Indies in general; it affords a rendezvous and coaling station for vessels engaged in protecting both the great outlets of the Mississippi and the Gulf. Hence the holding of it by the proper shore and floating defenses may be termed a military necessity. Key West has a further value in that it is the only connecting point between our Gulf and Atlantic defenses. It can never be independent of the sea for its communications, but it can be made a safe refuge for a fleet or for a single vessel if the enemy be not powerful enough to overwhelm the necessary defenses.

The advantages of Key West may be summed up as follows: The harbor is excellent and is reached by a main ship channel having a depth at mean low water of 28.5 feet; by the Southwest Channel there is 30 feet at mean low water, and ships may anchor in water of that depth. The mean rise and fall of the tide at Fort Taylor is 1.4 feet.



No dredging is necessary. It is easy of access; difficult, from having several channels, to blockade; the holding ground is fair; the protection from the sea good, but from winds indifferent.

The disadvantages of Key West may be summed up as follows: By the Southwest Channel a squadron of the heaviest armor-clads, drawing as much as 27 feet, can approach within easy range of the station, say within 2½ miles, and destroy it. There is a great scarcity of good potable water, and the island is subject to occasional very severe visitations of yellow fever, while the sanitary condition of the island is generally bad. The town being situated on an island of no natural resources, at a distance in the most direct line (and this only practicable for small vessels) of 130 miles from the nearest railroad terminus on the main land, is evidently unfitted for anything but an advanced naval outpost. The island itself is 3 miles in length, and from one-half to a mile in width; it rises but a few feet above the level of the sea, and is intersected by swamps and lagoons. It is an important coaling station for the North Atlantic Squadron. The coral formation of the island may offer advantages for excavated docks and basins, and sound foundations for heavy buildings. Communication between the docks and the anchorage by short artificial channels would be inexpensive.

The geographical position of the island is not favorable for a naval establishment; it lies near the track of the West India cyclones, and is unprotected except by the surrounding reefs. A dock-yard located at Key West would be exposed to attack by water from several directions at the same time, and to make this station secure against such attacks, would require very extensive fortification of the island itself and its numerous approaches by water, and even then it could be completely cut off from all connection with the mainland unless the United States had command of the sea. The distance from the mainland and the absence of every class of building materials, supplies, labor, and in fact all the requirements of a dock-yard are insurmountable obstacles to the location of a navy-yard at Key West.

Florida possesses a sea-board on the Atlantic and Gulf of Mexico of about 1,100 miles, which is exposed to water attack by the great naval powers, several of which have naval arsenals and dock-yards in the West Indies and the Bermudas. The advantages of establishing one or more naval stations for the protection of this coast and our commercial interests in the Gulf is self evident. While the eastern shore of the peninsula, the Florida Keys, and islands offer no safe or commodious harbors for such a purpose, the Gulf coast of the State possesses but two localities where a suitable site for a dock-yard might possibly be found.

#### TAMPA BAY, FLA.

The report of the Chief of Engineers, U. S. Army, for 1888, states:

The harbor at Tampa, at the head of this bay, was separated from deep water by a flat 2 miles wide, through this was a narrow channel with an average depth of about 8 feet, formed by the waters of Hillsborough River. \* \* \* Porto Tampa has been connected with Tampa by the extension of the South Florida Railroad, and has become the terminus of the Key West and Havana line of steamers; 15 feet of water can now be carried to Porto Tampa. \* \* \* At an estimated cost of \$63,000 for dredging 20 feet of water can be carried from the Gulf of Mexico to this point. The total estimated cost of the modified project is \$84,000.

This bay is on the west side of the peninsula, and its excellent harbor could be securely fortified, and probably fixed land suitable for docks and foundations for heavy buildings could be found; but the

situation is isolated from manufacturing centers and commerce, and too remote from every class of building materials both for ships and docks, as well as from supplies and skilled labor. The inland communications depending upon a single railroad, in addition to the above considerations, renders this locality decidedly objectionable.

#### PENSACOLA BAY, FLA.

Pensacola is a capacious, well sheltered, and safe harbor, land-locked by Santa Rosa Island, and having about 10 square miles of good anchoring ground for the largest class of vessels. On the outer bar between the east bank and Caycas Shoal there is 22½ feet of water, while on the inner bar, between the middle ground and Caycas there is 21½ feet at mean low water. After entering the bay, for a distance of 8½ miles to a point 2 miles east of the city, there is a depth of from 4 to 6 fathoms of water with good holding ground.

Under the conditions imposed by the Department's instructions to this Commission, the site of the present navy-yard would have to be abandoned or closed for construction purposes as it is no longer safe from the high powered guns of a fleet in the Gulf at a distance of 2 nautical miles. The present navy-yard is located on the eastern corner of a Government reservation of some 2,000 acres, stretching for a mile, from Tartar Point to Barrancas, on the north shore of the entrance to Pensacola Bay, and extending back to the Bayou Grande.

The chief water front of the yard is on the north shore and is therefore exposed to the prevailing south winds. This water front is a mile distant from Fort Pickens, a military post of great importance at the extremity of Santa Rosa Island, commanding the approaches of the bay, easily rendered impregnable to assault, and unquestionably the location of any modern fortification which may be erected for the protection of the bay. Reference to the chart will show that vessels can take station 2 miles distant from Fort Pickens and have the navy-yard within a range of only 2 miles with nothing but the low island of Santa Rosa intervening. An excellent position 4 miles from Fort Pickens and behind sand bluffs on the island, affords an open range of only a little more than 3 miles to the navy-yard. Nothing more need be said to show the extremely exposed position of the navy-yard to the attack of vessels armed with modern ordnance.

The most extensive fortifications on the island of Santa Rosa and at the entrance of the bay would probably be insufficient to protect the naval station at Warrington, consequently to make this fine harbor available, a site must be selected sufficiently remote from the gulf, and one capable of being strongly fortified against attack by water, should an enemy gain an entrance. In a search on the northern shore of the bay for a site combining the greatest number of natural advantages Emanuel Point was examined. This point of fixed land is 1½ miles to the eastward of the city, a half mile east of the Bayou Texar, and less than 1 mile from 4 fathoms water in the bay. It is also less than 6½ miles distant from the deep water of the gulf, and consequently unsuitable for a naval station. The water front at Gaberonne and Bohemia on the west shore of Escambia Bay, was then examined with no better results. The shallow water of the bay and the character of the land offering serious objections to both these sites.

The Commission is indebted to Lieut. G. Blocklinger, U. S. Navy, light-house inspector, who placed the light-house tender *Laurel* at their disposal, and kindly rendered every possible assistance in the inspection of the bay.

J. E. Simpson & Co., the contractors and builders of the Government dry-docks at New York and Norfolk, were employed by the Commission to make soundings and furnish plans and estimates as to the approximate cost of the construction of a timber dry-dock at Bohemia. Their report with plans and estimate is appended, marked L.

From this report, as well as from the chart of the survey, it will be seen that the character of the ground is unsuitable for excavated docks and basins, and that the cost of a dry-dock and dredged channel to the site would be excessive. In this report the opinion is given that a timber dry-dock, of the same dimensions as those now being constructed for the Government, but with the specifications adapted to the locality, owing to the necessity for wide embankments on either side of the dock, and substantial retaining cribs or bulkheads for protection against the ravages of the teredo, could not be constructed upon this site for a less sum approximately than \$1,465,000, and the time necessary for the construction would be placed at four years.

Bohemia is 5 nautical miles northeast of the city, 15 from the entrance to the bay, and 9 from the nearest point in the Gulf outside of Santa Rosa Island. From 4 fathoms of water, about 2 miles east of Pensacola, to the water front of Bohemia, an extensive cut 4 miles in length, varying in depth from 1 to 25 feet, would be required. By request of the Commission an officer of the Coast and Geodetic Survey, Mr. P. A. Welker, was detailed to make a survey of this portion of the bay, the map of which survey is appended, marked K. The ground covered by the party in making this topographic and hydrographic survey is the portion of Escambia Bay between Gабeroune and Devil's Point.

The following description of the locality examined for a navy-yard site is quoted from the very full and complete report of the survey made by Mr. Welker to the Superintendent of the Coast and Geodetic Survey:

A high bluff follows the beach closely as far as Gабeroune, where it turns back from the shore and follows around the swamp at a distance of from 400 to 500 yards from the shore. The bluffs at some places, especially where they are close to the shore, are very abrupt and much broken and cut up by large gullies. Springs of water leak out from these places, some of which disappear in the sand before reaching the shore. The slopes of the bluffs where they follow the shore are covered with vegetation and range from 30 to 50 degrees. Back of the swamp the slope is more gentle and uniform, being not more than 5 degrees in some places. The land back of the swamp is largely hummock, which is mostly covered with hard wood.

The general character of the bluff shows a mixture of clay and sand of a yellowish color. The beach is entirely sand, and the soil near the beach sandy. Very little of the soil is good for agricultural purposes. On a small portion of the land close to the beach oranges, peaches, plums, and vegetables are raised. With the exception of a few cleared patches close to the beach the whole tract surveyed is densely timbered. The trees are from 20 to 70 feet high and consist of pine, scattering live oak, water oak, and scrub oak, a little cypress and juniper in the swamp, red bay and sweet bay, and magnolia and palmetto. This timber is of little or no value.

The large fresh-water swamp shown on the map is heavily timbered, and has also a thick growth of underbrush of various kinds, generally scrub oak, and ranging from 1 to 10 feet in height. There is quite a large stream of fresh water running from the swamp into the bay: the level of the swamp is about 5 feet above high-water mark.

The Pensacola and Atlantic division of the Louisville and Nashville Railroad follows the shore line except for a short distance near Gабeroune, where it passes through the swamp. Bohemia is merely a railroad station, with a collection of houses for the section-hands. It is 6 miles distant from Pensacola, which is the nearest post-office.

The climate here is delightful, and probably the best in vicinity of Pensacola. Fish are plentiful in the bay, such as trout, bass, mullet, and Spanish mackerel, while oyster beds are found scattered over the bay. In the woods there are partridges and some wild turkeys.

The prevailing wind is from the south and southwest, coming up during the afternoon, when it is often very fresh. These winds sometimes come up very suddenly, and may produce a very rough sea.

The bottom of the bay in this locality consists of a very soft mud of a dark gray color. Close to the beach there is a crust of sand, but it is all mud underneath. Borings made by J. E. Simpson & Co., of New York, at 200 and 500 yards off shore show this same kind of mud at a depth of 30 feet in the latter case and 50 feet in the former below the surface of the bottom, only that it is more compact than at the surface. It also seems that there are strata of different densities. Sand was obtained at a depth of 40 feet near the shore. Another boring made on shore at the high-water mark showed, at a depth of 26 feet, finely divided sand. A pole can be shoved by hand to a depth of from 15 to 30 feet, and the tug-boats force their way through 3 feet of this finely divided mud. Oyster-beds are found scattered over the bay.

At Devil's Point (locally known as Gull Point) there is a long shoal extending from the point east to the old beacon. This shoal shifts from north to south with the prevailing wind. The southern limit of the work shows 18.7 feet of water, which is also the greatest depth. The least depth in the channel is found at the northeastern limit of the work, about midway between the old and new beacons, where there is 7 feet of water. Further out from this point, however, there is deeper water. The tides are largely diurnal, there being one high and one low tide each day, excepting the day after the one when the moon's declination is zero, when there are two high and two low tides; but the range is very small on that day. The mean range of the tides is 1.44 feet. The extreme between highest and lowest tides for thirty-six observations was 2.9 feet. High water nearly always occurred between 8 a. m. and 4 p. m.

Florida possesses a good climate, equable temperature, and, lying between the temperate and torrid zones, it is exempt from the sudden changes of the one and the excessive heat of the other, so that out-door work is practicable throughout the year. Statistics show that Florida is one of the healthiest States in the Union. Several varieties of oak, cypress, hickory, and pine are found in abundance, while large fleets of foreign ships are almost continually loading lumber and timber at Pensacola. The water from the artesian wells, which is used to supply the city, has been pronounced by Professor Chandler to be of the purest.

The absence of labor, both skilled and unskilled, and of supplies of material of all kinds has not heretofore been considered a serious drawback to the naval station at Warrington. It is possible, however, that the higher rate of wages paid by the Government to its employes, or, more correctly, the fewer hours which constitute a day's labor, in comparison to that at private ship-yards, together with the mild and healthful climate, would insure an abundance of all classes of laborers and meet all future requirements.

The railroad communication with the interior and with the Gulf coast is ample. The Florida Central and Peninsular Railroad Company extends from Jacksonville to Chattahoochee. Lateral lines connect this line with the Savannah, Florida and Western system by a branch from Live Oak north to Dupont, and to St. Mark's on the Gulf by a branch from Tallahassee. The same line extends from Fernandina, on the Atlantic, to Cedar Keys and Tampa on the Gulf. The Louisville and Nashville Railroad extends from Pensacola north to Birmingham and the coal and iron fields of Alabama. Birmingham, the center of the coal and iron industry of the South, is only 259 miles from Pensacola, while its distance from New Orleans is 417 miles, or 158 miles in favor of the former place.

At the request of the Commission the Chief of Engineers, U. S. Army, referred the question of the improvement and fortification of this harbor to the permanent Board of Engineers on Fortifications and other Defenses, and the following is their report thereon:

The depth on the inner bar at Pensacola is now 21.2 feet, and on the outer bar a foot more. It has been attempted to dredge a channel 24 feet deep and 300 feet wide across the inner bar; but the dredging does not maintain itself, and the rate of appropriation has been too slow to complete the work.

It is somewhat doubtful whether a reliable 25-foot channel across the outer bar can be obtained and maintained except by the use of jetties. A project for a single jetty

of an estimated cost of \$2,295,719 has been submitted to the Chief of Engineers by the local engineer.

The Board on Fortifications or other Defenses of 1885 recommended for this port two 12-inch guns, ten 10-inch guns, and two hundred submarine mines. The estimated cost was \$948,000. If an important navy-yard were to be established, say 4 or 5 miles above the city on Escambia Bay, it would be needful to increase this project; but the site is favorable, and can be defended against a fleet at moderate cost.

Should the Gulf of Mexico and the Caribbean Sea become the scene of a naval war involving the United States, this bay would immediately become the resort of our vessels for supplies, refitting, and whatever repairs could be made without docking facilities. Its great extent of well-sheltered anchorages, easy access from the Gulf, and security afforded by fortifications at its entrance would render it an invaluable base for naval operations in that region. It was in view of these natural advantages, and its central position on the coast, that the Commission authorized a thorough survey, soundings, and estimates for a dry-dock. Unfortunately, the physical conditions of the water front and the character of the bottom of the eastern end of the bay, where the examinations were made, were found to be unsuitable for either heavy buildings, excavated docks, or basins, conditions prohibiting the establishment of a construction yard without excessive cost, and therefore the Commission does not recommend a site for a naval dock-yard at Pensacola Bay.

A chart of Pensacola Bay is appended, marked J.

#### MOBILE BAY, ALA.

The geographical position of Mobile Bay is about as favorable for the protection of our interests in the Gulf of Mexico and the Caribbean Sea as that of Pensacola (from which it is distant but 40 miles), but its comparative importance as a site for a naval establishment will depend upon the special requirements of depth of water, accessibility for vessels of the heaviest draught, permanency of channel, etc.

Mobile Bay is a lagoon-like estuary, cut off from the Gulf of Mexico by the narrow sandy isthmus of Mobile Point and the chain of sandy islets on the south. It is, with the exception of a deep pocket in the southern end, called the Lower Fleet, extremely shallow. Its length from north to south is 34 miles; the northern half is from 7 to 8 miles wide, and very shallow; the southern half is from 15 to 18 miles wide. The Tenesaw River, debouching at the head of the bay on the eastern side, has two branches; the one along the eastern shore is the Blakely; the other, emptying into the bay in a southwesterly direction, keeps the name of the Tenesaw. The Mobile River, formed by the Alabama and Tombigbee uniting 30 miles north of the city, enters the head of the bay on the west side by two mouths, that passing the city keeping the name of Mobile, while the other branch, a mile to the eastward, is the Spanish River. The Spanish and the Tenesaw have a common mouth, a mile east of the city.

This end of the bay is a shallow delta, and with the exception of a slight elevation at Choctaw Point and the bluffs at Hollywood and Blakely, the bay is surrounded by flat sandy plains. The average depth of water is from 12 to 14 feet, but the Lower Fleet in the southern end, 6 miles in length and 2½ miles in width, has an average depth of 3½ fathoms; but while there is 21 feet of water in a small part of this lower anchorage, it would be unsafe for vessels of more than 21 feet draught to anchor in rough weather. The outer bar, 4 miles south of Mobile Point,

has a depth of 23 feet at low water, and this depth is reported to be increasing annually from natural causes alone. In May, 1889, an English steamer drawing 23 feet passed from the Lower Fleet, where she had finished loading, across the bar without touching. The channel from the bar to the entrance of the bay is sufficiently deep for the largest class of vessels, and its general direction is straight. The rise and fall of the tide is small and the tidal currents very feeble. From the upper end of the Lower Fleet a dredged channel 180 feet wide, of about 14 feet depth at low water, and 25.91 miles in length, extends to the city front, which channel, from information gained at Mobile, is liable to silt up by the muddy deposits from the several rivers emptying into the head of the bay.

With reference to the permanency of this artificial channel the following extracts from the report of the Chief of Engineers, U. S. Army, for 1888 are very instructive:

The present project for the improvement of this harbor was adopted March, 1880, the object being to afford a channel of entrance from the Gulf of Mexico to the city of Mobile, of 200 feet width and not less than 17 feet depth at mean low water. The channel had originally a minimum depth of 5½ feet through Choctaw Pass, and 8 feet in Dog River Bar. This was deepened by dredging under appropriations from 1826 to 1852, of \$228,830, to 10 feet through both. In 1860 the channel in Choctaw Pass had shoaled to 7½ feet. From 1870 to 1878 the channel was deepened by dredging to 13 feet, under appropriations amounting to \$447,561, and resulted in obtaining a channel with a minimum width of 300 feet, a minimum depth of 17 feet, and a maximum depth of 23 feet. The amount expended during the fiscal year ending June 30, 1888, is \$2,281. The channel has shoaled so that now the minimum depth is 14 feet and the maximum 23 feet. This channel was estimated to cost \$1,500,000.

Briefly stated, the cost of improvement to the present time is:

From 1826 to 1852.....	\$228,830
From 1870 to 1878.....	401,000
To June 30, 1887.....	747,561
To June 30, 1888.....	2,281
Total.....	1,379,672

to obtain a precarious channel of 14 feet; and the estimated cost of a channel 23 feet deep and 280 feet wide is \$1,500,000. This is exclusive of expenditures on the Alabama River above Mobile, for the removal of snags, logs, etc., from the channel, cutting overhanging trees from the banks, protecting caving banks and removal of sand-bars, etc. There is no reference to deepening the outer bar, or estimate for cutting a deep channel from Mobile to Mount Vernon. The cost of dredging a channel of the required depth, 27 miles in length in Mobile Bay, and to deepen the channel of Mobile River to Mount Vernon, a distance of 45 miles, would certainly be excessive, and judging from the engineer's report their permanency would be improbable, if not impossible. In a paper written by the distinguished English engineer Thomas Stevenson, under the head of Artificial Scouring, it is stated that "The preservation of the depth of harbors at a level lower than the original bottom involves both uncertainty and expense."

By direction of the Commission, Messrs. J. E. Simpson & Co. made borings at Mobile to determine the character of the subsoil and its suitability for excavated docks, wet basins, and for sustaining heavy structures. The following is a summary of the results obtained and reported to the Commission:

The first point at which soundings were made was at the lower end of the city front, near Choctaw Point. Several attempts were made at sounding, each time bringing up on sunken timber, causing much trouble to recover pipe, as logs were lying interwoven with each other. Four

soundings were made in the river at distances varying from 43 to 183 feet from the wharf line and to depths below the surface of the water of from 12 to 26 feet, all bringing up on timber. In the fifth sounding the pipe was driven to a depth of 31 feet 9 inches, reaching solid bottom. The sixth and last sounding in this vicinity was made 25 feet inside the wharf line, to a depth of 45 feet. This sounding drove very hard, and showed, from the top, 6 feet slab-wood and refuse matter, 13 feet bar sand, 24 feet coarse yellow sand, and 2 feet hard, white, sharp sand.

The second place where soundings were made was at South End, about  $5\frac{1}{2}$  miles south of Mobile, on the bay.

The first sounding was made at 620 feet off shore from the high-water line, and to a depth of 40 feet, the pipe driving hard. On withdrawing it, the lower portion of the core (equal to  $4\frac{1}{2}$  feet of earth depth) was lost; this would not compress sufficiently to remain in the pipe, being quicksand.

The second sounding was made at the high-water line on shore. A depth of 52 feet was reached, the pipe driving hard and the greatest difficulty was experienced in withdrawing it. The sounding showed, from top, 15 feet red clay mixed with sand; 15 feet clay with less sand; 13 feet fine sand; 9 feet empty pipe where quicksand would not compress.

#### MOUNT VERNON, ALA.

This site, suggested to the Commission, was also examined. It possesses many advantages in the character of the land, but not of water front, depth and width of the river, etc. The embankment at the river front about the Government reservation, with an elevation of 8 or 10 feet, ascends gradually as it recedes from the river to the arsenal, where it attains a height of 320 feet. Assuming that the ground here is suitable for the foundations of heavy buildings, machinery, and excavated docks, the position is too remote from the Gulf, and the engineering difficulties in its approaches through the bay and river are, in the opinion of the Commission, insurmountable obstacles to the selection of this locality as a navy-yard site. Mount Vernon is 29 miles distant from the city by rail, 45 by the somewhat tortuous channel of the river, and about 79 from the entrance at Mobile Point. Very extensive dredging would be required to open and maintain a channel in the Mobile River sufficiently deep to be accessible to the heaviest draught vessels, and its permanency, as of the channel in the bay, would be questionable. There are several abrupt turns in the river, and the channel at Mount Vernon is much too narrow to admit of the free turning of the larger class of vessels; in fact, the small revenue-cutter *Craicford* made use of about all the available channel for this purpose when the Commission visited that locality. Several other points above and below the Coosa River, and at 27-mile bluff, were examined with no better results. One railroad draw-bridge crosses the Mobile River and trunks of trees were lodged in the channel.

Among the many advantages of Mobile Bay or Mount Vernon for a naval station are the abundance of coal and iron in the central part of the State, ample facilities for inland transportation both by land and water, and a mild and healthful climate, suitable for out-door labor at all seasons. Facilities for obtaining labor are fair, there is an entire absence of the tere-do, potable water may be obtained from artesian wells, and at Mount Vernon there is the advantage of fresh water in the river.

After carefully weighing all the advantages and disadvantages

Mobile, the Commission is of the opinion that the absence of a suitable site on either shore and the extremely shallow water on both, are fatal objections to the establishments of a navy-yard or docks at Mobile.

The Commission desires to express their indebtedness to the collector of the port of Mobile and to Captain Keene, commanding the revenue-cutter *Crawford*, for their assistance and courtesy in placing the cutter at the disposal of the Commission when visiting Mount Vernon and inspecting Mobile River.

A chart of Mobile is appended, marked M.

#### BILOXI, MISS.

At the special request of Governor Lowry, of Mississippi, and in obedience to instructions received from the honorable Secretary of the Navy, the Commission visited Biloxi and inspected it with reference to its availability as a site for a navy-yard. At the present time there is very little water at Biloxi, and the following extract from the report of the Chief of Engineers will give a correct idea as to the feasibility of obtaining a deep-water dredged channel:

The amount expended during the fiscal year ending June 30, 1888, is \$16,177, and resulted in dredging a channel 8 feet deep throughout at mean low tide, and 126 feet wide from the 8-foot curve outside in Mississippi Sound, for a distance of 2,150 feet, thence 84 feet wide for a further distance of 2,000 feet, thence 124 feet wide a further distance of 1,030 feet to the 8-foot curve in Biloxi Bay.

On account of the hydrographic and topographic features of the place, the character of the back country, the distance from supplies of the most ordinary character, and the lack of railroad facilities, the Commission does not regard this as a favorable site for a navy-yard or a dry-dock.

#### NEW ORLEANS, LA.

The Commission inspected the land and water front about Jackson Barracks, the naval reservation below Algiers, the method of protecting the river bank at Goldsborough Bend, and the excavation for the proposed locks at the Mississippi and Lake Borgne Canal. In this work of examination the Commission was very much indebted to Lieut. Commander W. W. Mead, U. S. Navy, light-house inspector of the district, who kindly placed the light-house tender *Pansy* at their disposal. From the examination of these various points, and from the data furnished by the several committees in New Orleans, the following conclusions were reached.

The geographical position of New Orleans in its relations to strategic requirements in a general way is perhaps not as favorable as that of either Mobile or Pensacola, since its inland position, as well as the great velocity of the current of the river and the rise and fall of water due to annual freshets, must deprive it of the great advantages of a site on or contiguous to the Gulf, where these conditions do not exist. A naval station situated near the city would be remote from the sea, and be liable to be blockaded either by the obstruction of the narrow channel at South Pass, or by a superior naval force commanding its entrance. The channel between the jetties can be defended only by a strong naval force. The construction of batteries in the delta for defensive purposes would be, if practicable, enormously expensive, and Forts Jackson and St. Philip, 18 miles above the Head of the Passes, armed with modern ordnance, could afford no greater obstacles to the passage of armor-clads than they did to the fleet of wooden vessels in 1862.



The security of the naval station is regarded as of paramount importance. The project for the defense of the Mississippi River, as formulated by the Board of Engineers on Fortifications and other Defenses of 1885, "devolves the defense of the mouth of the river upon a naval force consisting of two floating batteries and twelve torpedo boats, re-enforced by submarine mines. It is supposed that these vessels will be able to prevent an enemy from blocking the channel between the jetties at South Pass and the cutting off of ingress and egress."

The following is a brief statement of the conditions favorable to a navy-yard site on this river: New Orleans is the terminus of six trunk lines of railroads. The communication by water with the vast extent of territory embraced in the valley of the Mississippi is unsurpassed. It is the principal commercial port of the Gulf States, and possesses great facilities for obtaining every class of building material, skilled and unskilled labor, and supplies; coal is abundant and cheap. The amount of commerce that passes in and out of the Gulf of Mexico is a very large portion of the total commerce of the United States. The amount of exports from New Orleans, coming from the whole Mississippi basin and much of the great West, will demand protection at any cost, and consequently whether the navy-yard be located at New Orleans or elsewhere, the Passes and all the approaches to the city will have to be defended as thoroughly as military and naval skill can effect it. Such being the case, and since there is no other point in the Gulf of equal importance, or the closing of which would do as much injury to so large a district or to so many people, no other place will have or begin to have the same protection and care unless the Government establishes elsewhere a navy-yard, and it is absolutely necessary to protect it in order to retain the command of the Gulf.

The city is subject at intervals to epidemics of yellow fever, but from a comparison of its vital statistics with those of other cities it does not appear to be exceptionally unhealthy. (See report of Surgeon John W. Ross, U. S. Navy, in Appendix, marked A.)

At the South Pass there is a depth of water through a straight and narrow channel between the jetties of more than 26 feet, and a width of more than 200 feet for a distance of 11 miles. The central depth of this channel exceeds 30 feet, there is no indication of the formation of a bar in front of the entrance, and it is assumed that these favorable conditions will be maintained, as no dredging has been required since 1883. The Mississippi River Commission states that in its opinion the channel at South Pass Jetties is permanent in the sense that it will be possible to maintain a channel there of at least 26 feet depth at low water in the river, so long as the jetties are maintained to deep water and the damages from storms are repaired.

In the report of the Chief of Engineers for 1888, under the head of the "Survey of South Pass from its head to South Pass Light-House," it is stated:

As compared with the survey of 1875, there has been a decided shoaling throughout the Pass, except in a reach 2,800 feet long, commencing at a point 1,150 feet above South Pass Light-House, which deepened an amount varying from 3 to 6 feet. The localities which have shoaled the least and but slightly are those near Grand Bayou and Goat Island. The greatest shoaling is above Grand Bayou, and varies from 5 to 18 feet in a vertical height, while below the bayou it varies from 4 to 10 feet.

The least depth obtained during the year in the reach above Goat Island was 28.7 feet, and the least width at any time of the 26 foot channel was 290 feet. The greatest depth in this reach during the year was 30 feet, and the 30-foot channel was 300 feet wide. The present depth is 29.5 feet, and the 26-foot channel is 350 feet wide.

The least depth in the Grand Bayou reached during the year was 27 feet, the

greatest 28.4 feet, and the present depth, 28.2 feet. The least width of the 26-foot channel was 130 feet, the greatest 280 feet, which is also the present width.

"A channel through the jetties 26 feet in depth, not less than 200 feet in width at the bottom, and having through it a central depth of 30 feet, without regard to width," and "a channel having a navigable depth of 26 feet," through the shoal at the head of South Pass, and "through the Pass itself," was maintained throughout the year without the aid of dredging, and as required by law.

The report goes on to explain at length the cause of the shoaling, and states that the required depth has been maintained between the jetties, but the jetties require constant supervision and work from time to time. In the regulations issued by the War Department for the navigation of the South Pass channel it is stated that "there is a maximum depth of 30 feet between the jetties and over the bar, but as the channel is narrow and mud lumps may exist at the mouth, vessels drawing over 12 feet must exercise care in entering the Pass; strangers should not attempt to go in without a pilot."

In the absence of land defenses a strong naval force would be required to protect the entrance as well as the Head of the Passes. The destruction or removal by an enemy of the aids to navigation in such an exposed position, or the obstruction of the channel by sunken vessels, would effectually blockade the port.

The rise and fall of the tides in the Gulf, at springs, average 18 inches. The depth of the river along the shore at New Orleans varies from 20 to 30 feet, and from 100 to 200 feet in mid-stream. The holding ground is reported to be good, but a serious objection attends the holding character of the bottom; the anchor, sinking through the soft mud, becomes imbedded in the tenacious clay beneath and remains there unless frequently sighted, so that cutting the cable becomes sometimes a necessity; this, however, would be favorable to permanent moorings.

The velocities of the river current at different times, as given by the Mississippi River Commission, are:

Maximum at high water, 6.25 feet per second = 3.68 geographical miles per hour.

Minimum at low water, 1 foot per second = 0.6 geographical mile per hour,

and extreme rise and fall of river at New Orleans about 17 feet; average about 12 feet. The great velocity of the current, together with the great rise and fall of the river during the spring freshets, produces very unfavorable conditions for the safe and easy handling of vessels, as well as the navigation of the river. It is doubtless true that there are many parts of the banks of the river within the harbor limits which are and have been unchanged for years, and that it is practicable by the methods of bank protection now employed by the Mississippi River Commission to prevent entirely the caving of the banks. This is said to have been accomplished at Goldsborough Bend.

The Mississippi River Commission states that the protection of this bank by spurs and revetments forms a part of the improvement of the harbor of New Orleans now in progress and can be done at a reasonable and admissible cost. As this work of protecting the river bank is in progress at the present time and quite independent of the question of locating a navy-yard at the city, it cannot be taken into consideration when summing up the expenses of locating a Government establishment at this point, but may be considered as a point in its favor from the fact that they have proved themselves so effective hitherto wherever employed. The Commission is further informed that the levee just below Algiers, and opposite to Jackson Barracks, was built in the early part of the present century and that its location has remained unchanged, thus demonstrating that the river's encroachments on this

shore are hardly perceptible, even in such a long period of time. It was near the scene of the improvements at Goldsborough Bend, but before they were made, where the banks, and wharves on heavy pilings, and the railroad station of the Texas and Pacific Railway fell into the river. Since the improvements have been made the wharves and buildings have been replaced, and there is now no apprehension felt as to their safety.

The fitness of the soil on the river banks for bearing heavy structures, if properly piled, is unquestionable. The massive buildings, seven and ten stories in height, of the Louisiana sugar refinery, constructed partly on the batture land, attest the truth of this statement. They are, however, at a safe distance from the encroachments of the river.

Canals for very light vessels connect the harbor with the western Gulf coast, and others are projected between the river, Lake Pontchartrain, and Mississippi Sound, but the levee has not as yet been cut at any point. The Lake Borgne and Mississippi River Canal, now in the course of construction and which is to be connected with the river by locks, is designed for the use of the light draught vessels that navigate the shallow waters of Lake Borgne. (For plans and views of the work at the locks see appendix, marked N.)

The engineering difficulties to be encountered in constructing an excavated dock with a depth of 25 feet on the blocks below low-water mark, and probably 40 feet below high-water mark of the spring freshets, with gates of a suitable depth connecting with the river through the levee, will be great, but not necessarily insurmountable. The Commission was informed that there was no record at New Orleans of an attempt at the construction of an excavated dock, even for vessels of moderate draught, on the banks of the Mississippi River; the great rise and fall of the water and the rapid current have probably prevented such an undertaking. The construction of one now would be experimental, and possibly very difficult, but by no means impossible.

Examinations that were made at Algiers by Messrs. J. E. Simpson & Co., under directions from the commission, to determine the possibility of constructing an excavated dry-dock, gave the following results. (For full report see appendix, marked C.) It is to be noted in this connection that no mention is made as to the cost or difficulty of cutting a gateway in the levee, nor the probable results to the adjacent banks of the river. The site selected for the examination is situated opposite the lower end of New Orleans at Algiers, and embraces as a Government reservation a plot 384 feet wide, running back 2,880 feet; the land in front is about 4 feet below the level of the levee and slopes gradually to the rear. The bottom of the river close inshore slopes away at an angle of about one in two, giving a depth of 30 feet at a distance of 70 feet from low-water mark, or 180 feet from the levee. At 400 feet from the levee, nearly opposite the middle of the reservation, the low-water depth is 54 feet. Soundings were made with a 2-inch pipe near the water's edge, and at about 200 and 600 feet back along the center line of the plot, to depths of from 26 to 40 feet below the Gulf level, and all showed the same characteristics; that is, after the first 8 feet, which was easily penetrated, the driving gradually became harder, finally requiring heavy blows to sink the pipe one-quarter of an inch.

At the first point, when a penetration of 30 feet 3½ inches had been reached, it was deemed best to withdraw the pipe, the adhesiveness of the clay which the pipe brought up showing good resistance. The specimens showed dark clay, harder and more compact as the depth increased. The second sounding was made to a depth of 42 feet below the surface of the ground, the pipe drove harder until finally, with well-

directed blows, it could only be driven one-eighth of an inch at each blow; the pipe was then withdrawn, using a 20-foot lever. This sounding showed the same character as the first one for a depth of 24 feet; for the next 12 feet there was a mixture of two parts stiff clay to one of sand, and the final 6 feet was stiff clay and sharp sand. The third sounding, to a depth of 26 feet, ended in stiff clay. (For plan of borings see Appendix, marked P.)

The *Teredo navalis* does not exist at this point and there is nothing in the water or soil destructive to timber. The only objection that can be urged to a dock at this place is the rise of the river during freshets; this would necessitate the placing of the coping of the dock at or near the level of the top of the levee, or about 13 feet above low-water mark. The Mississippi River Commission gives the extreme rise and fall of the river at New Orleans at 17 feet; this discrepancy is more apparent than real, since one statement refers to the difference between the extreme high and low water, while the other refers to the rise above Gulf level. The observations of the Mississippi River Commission were made at Carrollton, just above New Orleans, and there is a difference of about 1.2 feet between that place and Algiers in favor of the latter place. This great depth would, of course, increase the cost of a dock at this place, but presents no insurmountable difficulties from an engineering point of view. The time required to construct a dock here would approximate three years; the cost, \$840,000.

The present reservation with a front of only 384 feet is too small for the purpose for which it is intended, and if the Government decides to place the navy-yard at this point it will be necessary to purchase more land. The following information relative to the property on either side of the reservation is taken from certified information furnished the commission by the assessor of the district in which it is situated: Above, or to the west of the reservation, there are two vacant lots owned by different parties; the first, 672 by 7,680 feet, and the second 500 by 7,680 feet. The depth in this property includes both cleared and wooded land. As regards the price at which the Government could purchase this land it could not be determined, as the representatives of the estates say they do not care to sell unless compelled to, though they say they would expect to be reasonable if the Government wished to purchase with a view to establishing a navy-yard there. The riparian rights, or "batture privileges," go with these as with most of the property along the river at this point and further down.

Below, or to the east of the reservation, the adjoining property, 192 feet front, 7,680 feet deep, is owned by the same party that holds the land, 4,790 feet deep, directly in rear of the reservation. The tract next adjoining has been considerably subdivided into small holdings, while the batture land is held by still another party, forming the exception to the usual rule regarding property in this neighborhood. The price at which the Government could acquire sufficient of this property to enlarge the present reservation to any extent desired would be on a basis of \$5,000 per tract of 192 by 2,870 feet (1 arpent front by 15 arpents deep) for unimproved land, and about double this sum for improved land, or in proportion to the improvements.

At the excavation for the canal locks, before mentioned, borings were made to a depth of 56 feet below the Gulf level, and, by marks registered there, 72 feet below the highest known water rise—that of 1874. The result of these soundings showed the same dense blue clay the entire depth as had been found in the other soundings.

While the Commission believes that the ground at Algiers is well adapted for building a timber dry-dock it is not prepared to concur in

the opinion that serious engineering difficulties are not to be encountered in the construction of its entrance to the river. A dry-dock with its caissons of a depth extending some 40 feet below the top of the levee might possibly lead to the formation of bars at the entrance; in fact, there is little doubt but that in course of time a deposit would be formed in front of any opening that might be made in the levee. There is no reason to apprehend any more serious trouble than this, and as it has been found necessary to dredge in front of the entrance to the dry-docks at both Boston and New York there is no ground for supposing that this will entail any excessive expense or interfere materially with the usefulness of the dock.

The adjustment of launching slips and ways to the varying stages of the river is another difficult problem for the engineer, since they will have to be so constructed as to permit the launching of a ship at a low stage, if not the lowest stage, of the river and at the same time keep the stern almost clear of the water at its highest stage. The extreme rise and fall at this point is not far from 17 feet; this, if the ordinary incline of seven-eighths of an inch to the foot is given, would involve the expense and difficulty of continuing the ways back 233 feet further than would be needed at the lowest stage of the water; besides this, the usual depth of water along the banks at time of freshet is about 20 feet at a distance of 120 feet from the levee, and deepens to 70 feet at a distance of 370 feet, so that there might be trouble in supporting the outer ends of the ways for launching a heavy armor-clad, say of 10,000 tons, at extreme low water. This difficulty of arranging the launching slips would be an inconvenience certainly, but it could be met by so adjusting the ways as to admit of launching at anything but extreme low water; which would cut out only a very short time in the late summer, when it would be impossible to launch a ship, and it would not be necessary to put the stern of the ship above high-water mark, since in the slip there would be no current, and there would be no harm done if the stern-post was in the water, as sometimes happens now at some of the northern yards at high tide. Should building docks be resorted to in order to obviate this trouble, as at some of the private European dock-yards, Naval Constructor Hichborn expresses the opinion that though as a rule they are damp, dark, and contracted, the system has one advantage, that all the weights are lowered into their places, no hoisting being required.

After carefully weighing all the advantages and disadvantages of Algiers as a site for a naval station, the Commission is of the opinion that while the spot is not an ideal one, no other place in the Gulf compares with it in the advantages offered, and that the advantages are so many and so great and outweigh the disadvantages to such an extent, that the Commission has no hesitation in recommending the location of a navy-yard and dry docks at the present Government reservation at Algiers, Louisiana.

A chart of New Orleans is appended, marked O.

Very respectfully, your obedient servants,

W. P. McCANN,

*Commodore, U. S. Navy, President Navy-Yard Site Commission.*

ROBERT BOYD,

*Captain, U. S. Navy.*

WILLARD H. BROWNSON,

*Lieutenant Commander, U. S. Navy.*

DUNCAN KENNEDY,

*Lieutenant, U. S. Navy, Secretary to Commission.*

Hon. B. F. TRACY,

*Secretary of the Navy.*

## APPENDIX A.

U. S. NAVY-YARD, PENSACOLA, FLA.,  
*Surgeon's Office, August 26, 1889.*

SIR: Your letter requesting information and opinions for the Navy-Yard Site Commission regarding the healthfulness of New Orleans, Mobile, and Pensacola, was duly received.

I inclose herewith communications upon the subject from men whom I consider the best authorities of the three places in question.

Dr. Hargis has for a great many years been the leading medical man of Pensacola, and has given particular attention to public health matters, especially to yellow fever. Professor Chaillé of New Orleans, and Dr. Mastin, of Mobile, have national reputations with which the Commission is doubtless familiar.

Professor Chaillé's views and facts, especially those expressed in his letter of the 18th instant, are so entirely in accord with those which I had formed and collated that I shall take the liberty to refer the Commission to them and refrain from the repetition in words of my own.

Looking at Pensacola, Mobile, and New Orleans from a sanitary point of view, I do not see any important difference between them as sites for a navy-yard. Their respective pros and cons about counterbalance one another. Moreover I do not see any objection that could logically be made to either place upon the score of unhealthfulness. The time is fast approaching, if it has not already arrived, when yellow fever will be as effectually barred out of Pensacola, New Orleans, and Mobile, as it has been from Norfolk and Philadelphia.

Malarial fever, the great curse of the South, West, and many parts of the North, may be shorn of nearly all its terrors by the proper observance of a few long-known and well-established precautions, such as sleeping in upper stories, thorough drainage of the soil, &c.

Very respectfully,

J. W. ROSS,  
*Surgeon, U. S. Navy.*

Lieut. DUNCAN KENNEDY, U. S. Navy,  
*Secretary to Navy-Yard Site Commission, Washington, D. C.*

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## APPENDIX B.

Report of soundings made at Pensacola, Fla., June 2, 1889, together with plans of same, and approximate estimate of the cost of construction of one of Simpson's improved dry docks adapted to the location and its surroundings.

The site as proposed is located at Bohemia, Escambia Bay, about 6 miles northeast of Pensacola.

This site forms a hollow between two extended points, Gaberonne and Devil's Point. At each of these points and along the bay the land rises in bluffs (close to the water) from 60 to 120 feet high, the tracks of the Pensacola and Atlantic Railroad running between bluffs and water.

At the place designated, Bohemia, the land is flat marsh for a distance of one-half mile back from shore, then rises to the height of surrounding bluffs; water shallow—8 feet in depth a distance of  $1\frac{1}{4}$  miles out, in line of Bohemia.

A line from Gaberonne to Devil's Point would extend about  $1\frac{1}{4}$  miles, bringing Bohemia three-eighths of a mile at a right-angle further inshore.

From a small steam-launch we sounded in 4 feet of water, 250 feet from shore with a sounding-rod 13 feet in length; rod met with slight resistance for 12 to 14 inches, then went down of its own weight.

We next sounded inshore at water's edge; beach covered with coarse sand; it required hard work, jumping the rod up and down, to get down 4 feet, after which it was easily thrust its entire length; this at a point immediately in front of chimney shown on plan.

This point has apparently been the outlet to a stream running from the swamp.

We next went 400 feet out from shore; water 4 feet deep. Rod was readily pushed to water level.

We then went 50 feet farther out, with same result.

At 550 feet out from shore the water was 5 feet 6 inches deep and the rod with difficulty thrust down for a distance of 2 feet, and then the rod went down very easily.

One thousand five hundred feet from shore the material was very soft; water 6 feet deep, rod going down of its own weight as far as we could reach.

Seventh sounding made about 200 feet farther south, same distance out, gave same result; all above soundings made at low water; mean tide, 1.3 feet; wind varying tide 6 to 10 inches. The last four soundings were made from a skiff.

Tuesday, June 4, 1889, Captain Saunders, who has the only floating pile-driver at this place, having failed to be ready for us, we secured 60 feet of 1-inch pipe and with this made one sounding at a point 1,680 feet from shore and 4,000 feet south-south-west from Devil's Point, measured by Mr. Welker, civil engineer, an officer of the United States Coast Survey.

At this point the water was 7 feet 6 inches deep; pipe went with easy pushing to 28 feet below high water, then with light taps of maul to 38 feet below high water. The pipe was then hauled and showed soft, slimy, black mud to within 2 feet of bottom, where there was a mixture of fine sand sufficient to feel gritty.

The wind interfering with out-shore work, we started at shore-line, at a point east of chimney, marked B; by jumping the pipe up and down it penetrated 12 feet and was then driven with mallet to 26 feet 2 inches below high water. The pipe turned freely by hand until 24 feet was reached, then it commenced to drive harder until we reached 26 feet 2 inches below high water, when the pipe bent at top and was hauled; bottom showed mud mixed with coarse sand for 2 feet, balance to the top all sand.

Wednesday, June 5, we towed pile-driving machine from Pensacola to Escambia Bay; owing to shallow water, the tug cast the machine adrift, one-quarter of a mile from shore, and the strong wind soon carried it ashore. An effort was made to drive a pile at this point, but little could be done, as engine would not lift 1,800-pound hammer until wooden lagging was removed from drum.

We, however, drove one stick 13 feet 6 inches into sand at a point 16 feet from water's edge, it driving very hard, through clean coarse sand.

Thursday, June 6, pile-driver being aground, we used it to make sounding from; we drove 2-inch pipe 25 feet; this drove very hard after the first 10 feet, bending top end of pipe; we hauled pipe and found coarse sand its entire length—this at a point 40 feet from bank, about 800 feet northeast from chimney, marked C.

Then with 1-inch pipe we made sounding off launch in line 800 feet out from C, marked D, pushed pipe 32 feet below high water, then drove with light mallet to 50 feet below high water (water 6 feet deep), in endeavoring to pull this pipe the launch lurched, the lever slipped, and pipe broke after starting up some 5 or 6 feet; the point at which pipe broke being at 30 feet below high water, no result other than approximate could be obtained from this sounding, which seemed soft all through.

We next started from shore with skiff, sounding with 20-foot pole; starting with sand or apparently hard bottom close to shore, we worked out, sounding in the vicinity of site with pole.

We found water depth to increase slowly, while mud depth increased more rapidly.

From a point at zero at shore-line, we pushed the pole to water-level at a point 700 feet out from shore. At places the bottom is covered with a crust, a short distance below the slimy top; out from the center line of Bohemia, this crust is thinner than at either side, and for this reason every effort was made to find solidity. A sounding lead weighing 10 pounds penetrated from  $1\frac{1}{2}$  to 2 feet into mud below water.

Saturday, June 8, having secured from Mr. E. F. Skinner, of Escambia (through the intervention of Mayor Chipley), a good flat scow, we made sounding, marked E, 30 feet from shore; water 18 inches deep; the pipe penetrated 36 feet, driving very hard; result, sharp coarse sand for entire depth. This sounding was made 825 feet northeast of chimney (this line was worked out as showing best possible chance for hard bottom, judging from previous soundings with pole and rod).

We next drove sounding marked F at a point 320 feet from shore on same line, water  $5\frac{1}{2}$  feet deep. The pipe was driven 28 feet below high water; bottom hard sand for a depth of 15 inches, then 12 inches of sand mixed with mud, balance above that was soft mud.

We next drove sounding marked G, on same line 680 feet out—water 6 feet 6 inches deep; with the 1-inch pipe, we just reached hard sand at 32 feet below high-water level; with the exception of one foot at bottom, of mud and sand mixed, this sounding showing soft mud for its entire depth. The pipe was put down by hand in this sounding.

We next made sounding marked H, 1,100 feet out, water 7 feet deep. The pipe fastened to pole was pushed by hand to a depth of 43 feet 3 inches below high water, when sand was reached—entire depth except about one foot at bottom was soft mud.

These pipes, G and H, were pushed down until they brought up hard and then raised, the bottom showing about one foot of sand. All these soundings were made off steady lighter and clearly demonstrated the shape of bottom from shore-line out.

These were all the soundings made at Pensacola.

At this place we find the *teredo* doing great damage to pile structures, several ruins of wharves bearing evidence of their ravages. The Louisville and Nashville Railroad Company have cast a cement covering around the piles in the bridges and wharves, although they had been creosoted. It was contended, however, by some that the piles in question had been improperly and insufficiently treated. However that may be, it is a fact that the Louisville and Nashville Railroad have made molds which a diver places below water and around the piles, then fills to above water-level with cement, thus forming a sleeve about 2 inches thick.

The vast amount of slippery ooze, or mud, which covers this bay is the output of large swamps, which abound all along the rivers which empty into this bay, and while our soundings here showed a rather even slope to hard bed, yet there are evidences of undulating bottom all around here.

In building some of the wharves at this place they put down 40-foot piles with lever; at other points in same wharf 30-foot piles drove hard. Some wharves have sunk in middle of length.

At the bridge across the Escambia River (bridge  $2\frac{1}{2}$  miles long),  $3\frac{1}{2}$  miles above site, the piles vary from 35 feet to 80 feet in length. Mayor Chipley, who is president of railroad, mentions some instances where piles sank to 40 feet with one blow of hammer, while in other places they drove hard.

From the best evidence obtainable, it appears that in the upper section of the bay the hard bottom is usually found at a great depth, while above such hard bottom is slimy mud, through which boats can readily pass to depth of 3 to 4 feet.

At the marine railway, now building, on the opposite side of bay, they are using some 5-inch iron screw-piles 70 feet long. Facilities for doing the work of sounding or obtaining help at this place were miserable.

From the foregoing results, obtained after patient investigation, we are of the opinion that a timber dry-dock of same dimensions as those we are now building for the United States Government, the specification being adapted to the location (owing to the necessity of wide embankments on either side of dock and substantial retaining-cribs or bulk-heads for the protection against the ravages of the *teredo*), could not be constructed upon this site for a less sum, approximately, than \$1,463,000, and the time necessary for its construction we would place at four years.

We beg to respectfully submit the foregoing.

J. E. SIMPSON & Co.

NEW YORK, August 2, 1889.

## APPENDIX C.

Report of soundings made at Algiers, opposite New Orleans, La., May 27, 1889, together with plans of same and approximate estimate of the cost of construction of one of Simpson's patent improved dry-docks adapted to the location and its surroundings.

The site, selected as marked upon chart, is situated opposite the lower end of New Orleans, at a place called Algiers, and embraces a plot about 400 feet wide, running back about 2,000 feet to low land, the land at this point being about 5 feet below the level of "levee." The levee center to river-bank at this time was 107 feet. The water-level at this date was 3 feet and 6 inches above "gulf-level," or what is termed a low stage.

From information furnished by Major Harrod (city surveyor) we ascertained that water-levels are taken from "gulf-level" as standard zero.

The sounding marked A was first taken at a point about center of plot; a 2-inch pipe was used. The point selected was 10 feet distant from water edge, upon sloping bank, and 4 feet 34 inches above water. The pipe was driven 30 feet 34 inches, or 22 feet 6 inches below "gulf-level." The driving, after first 8 feet, gradually became harder, finally requiring heavy blows to sink pipe one-quarter of an inch. The rammer was of live oak, weighed 60 pounds, and was worked by two men, the drop being 2 feet 6 inches. When this penetration had been reached, it was deemed best to withdraw the pipe, which was accomplished by use of chain and lever, the adhesiveness of clay which pipe brought up showing good resistance. The specimens showed dark clay, being harder and more compact as depth increased.



A second sounding was made at a point inside of levee, distant from A 184 feet, on same line (center of plot), and marked B. This sounding was made to a depth of 42 feet below the surface of the ground, the pipe driving hard until finally, with well-directed blows, it could only be driven one-eighth of an inch at each blow. The pipe was then withdrawn, using a 20-foot lever. This sounding showed clay of the same character as at A for a depth of 24 feet; for the next 12 feet was a mixture of two parts stiff clay to one of sand, and the final six feet was stiff clay and sharp sand.

A third sounding, marked C, was made 400 feet inland from B, to a depth of 26 feet, ending in stiff clay.

A severe storm of rain, with vivid lightning, ended labor for the day.

We next visited the excavation at the Gulf Canal at a place on the New Orleans side of river at a point about 11 miles below the center of the city.

The excavation at this place having been made to a depth of 23 feet from surface of ground, without disturbing the sides, although they were soft at top and often soaked with surface water or "seepage."

The soil appears to be clay for the entire depth of excavation; darker at top, and at bottom a compact bluish clay.

This was deemed an excellent opportunity for deep sounding to test the clay (or mud, as termed here), said to line the bank of the Mississippi River.

Our tools and appliances having been shipped to Pensacola, 1½-inch pipe was secured, but after three vain efforts to drive (the pipe breaking each time), 41 feet of 1-inch pipe was secured and driven to a depth of 39 feet below the lowest point of excavation.

Excavation 17 feet below gulf level, sounding therefore 56 feet below gulf level, and by mark registered here 72 feet below highest known water rise of 1874. The result of this sounding shows same clay for entire depth.

Upon the next day three test-piles were driven at the Algiers site. (It may be remarked that all piles driven in the vicinity of New Orleans are square, usually 13 by 13 inches at larger end and 10 by 10 inches at the other, and varying from 35 feet to 70 feet in length, the ends not pointed).

These being the only kind of pile obtainable we used such, but pointed them before driving.

An 1,800-pound hammer was used; the guides of the machine admitted of only a 45-foot drop; in order to get piles under hammer they were sawn off to 60 feet.

The first pile was driven at up-river end of plot, marked D, water 8 feet deep 12 feet from bank.

The weight of pile and hammer combined caused a penetration 9 feet; thirty-two blows caused a further penetration of 18 feet; this was with cushion block of wood on top of pile, to save ring (the usual method employed at this place). Dispensing with the cushion and driving directly on ring, seventy-eight blows caused a further penetration of 17 feet; ten blows more were struck, carefully raising the hammer to top of ways, driving the pile only 13 inches further.

Total penetration, 49 feet 7 inches below "gulf level."

Drop of hammer about 37 feet.

A second pile of same dimensions, marked E, was driven at a point 120 feet down river (in line of first pile D); water 8 feet deep. This pile sunk with weight of hammer 9 feet.

First twenty-five blows: penetration 7 feet 6 inches.

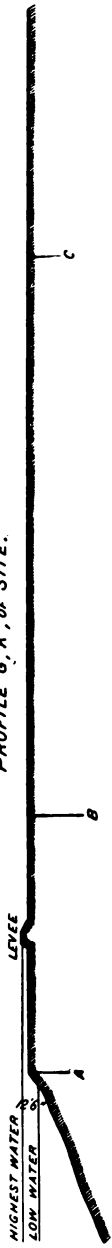
Second twenty-five blows: penetration 13 feet 6 inches, after which eighty blows were struck, the penetration varying from 5 to 1½ inches, ending 43 feet in soil and 47 feet 6 inches below "gulf level."

The third pile, marked F, same dimensions as D and E, was driven at lower line of plot, 10 feet from bank, water 7 feet 5 inches deep. Pile sank under hammer 7 feet 6 inches. The penetration of this pile was carefully noted after each ten blows with result as follows:

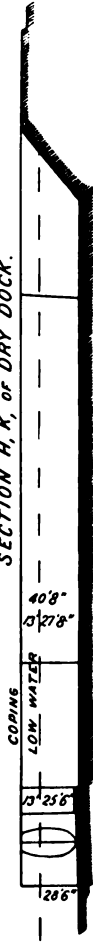
	Penetration.
	<i>Feet. In.</i>
First 10 blows .....	12 2
Second 10 blows .....	2 9
Third 10 blows .....	1 2½
Fourth 10 blows .....	2 6
Fifth 10 blows .....	1 5
Sixth 10 blows .....	1 2
Seventh 10 blows .....	1 9
Eighth 10 blows .....	1 2½
Ninth 10 blows .....	1 0
Tenth 10 blows .....	0 10
Eleventh 10 blows .....	1 0



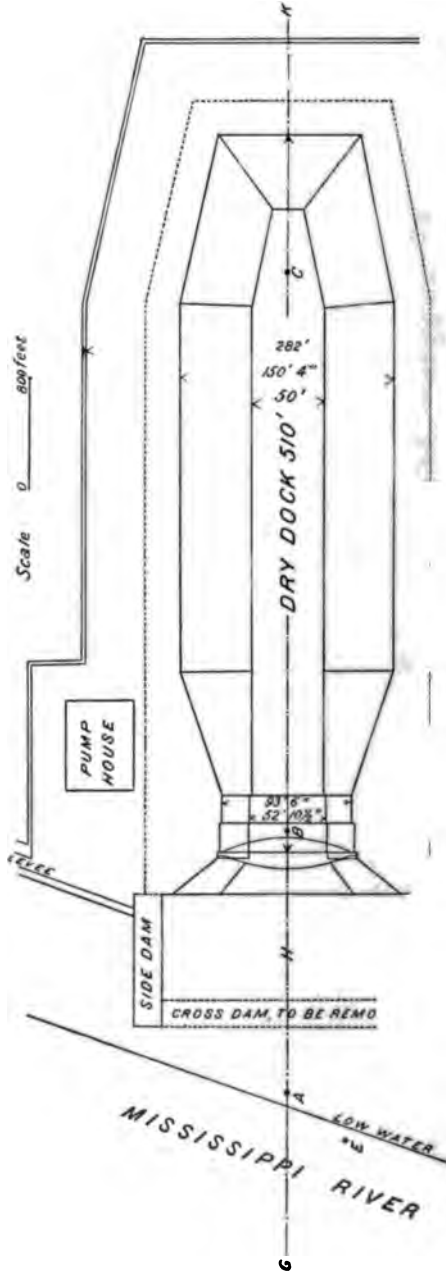
PROFILE G, K, OF SITE.



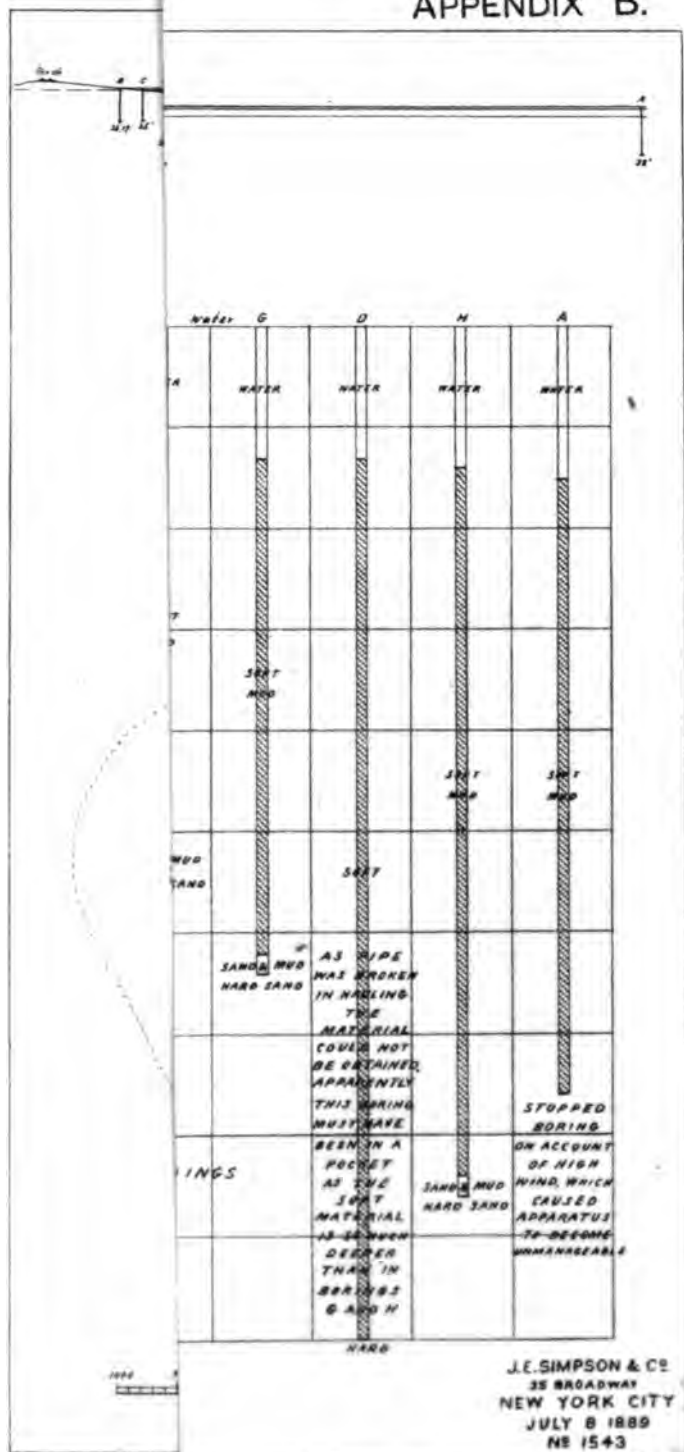
SECTION H, K, OF DRY DOCK.



Scale 0 800 feet



# APPENDIX B.





## NO. 8.—REPORT OF THE BOARD OF VISITORS.

UNITED STATES NAVAL ACADEMY,  
*Annapolis, Md., June 7, 1889.*

SIR: The Board of Visitors to the Naval Academy has the honor to submit the following report:

The Board convened on the 1st instant, and organized by the election of Commodore George Brown, U. S. Navy, president, and Senator M. C. Butler, of South Carolina, vice president; Lieut. Richard Wainright, U. S. Navy, secretary, he having been detailed for that duty by the superintendent of the Academy.

### STANDING COMMITTEES.

- (1) *Condition of admission to and discharge from the Academy.*—Hon. M. C. Butler, Hon. H. A. Herbert, Hon. C. H. Grosvenor, Commodore George Brown.
- (2) *Subjects of study and standard of scholarship.*—Hon. H. M. Teller, L. C. Garland, LL. D., General F. A. Walker.
- (3) *Grounds, buildings, and sanitary condition.*—Hon. William McAdoo, Governor J. A. Beaver, Hon. C. H. Grosvenor.
- (4) *Seamanship, ordnance, and navigation.*—Commodore George Brown, Governor J. A. Beaver, Hon. William McAdoo.
- (5) *Discipline, drill, practical exercises, administration and police.*—General S. L. Woodford, General F. A. Walker, Hon. M. C. Butler.
- (6) *Steam, mathematics, physics, and mechanics.*—Dr. T. C. Mendenhall, Prof. Oren Root, General F. A. Walker.
- (7) *English studies, modern languages, drawing, physiology, and hygiene.*—Prof. Oren Root, L. C. Garland, LL. D., Hon. H. M. Teller.
- (8) *Finance and library.*—Hon. H. A. Herbert, Commodore George Brown.
- (9) *Final report.*—Hon. C. H. Grosvenor, General S. L. Woodford, Dr. T. C. Mendenhall, Commodore George Brown.

General Stewart L. Woodford was elected orator.

Sessions of the Board were held daily during the continuance of the examinations.

### CONDITIONS OF ADMISSION TO AND DISCHARGE FROM THE ACADEMY.

The Board, after careful consideration of the subject, unanimously recommends that the academic course be reduced from six to four years, and that at the end of four years the graduates be commissioned as ensigns. It also recommends that it shall be required by law that the

designation of persons for appointment, and their alternates, to fill vacancies occurring from graduation, be made one year in advance when practicable.

The Board also recommends a change in the law fixing the maximum limit of age for entrance into the Naval Academy at twenty (20) years. In its opinion nineteen (19) years is the better limit.

The Board has made diligent inquiry in order that it might ascertain, if possible, the effect upon cadets of the law, first enacted in 1882, limiting the number of admissions into the Navy.

It was reasonable to suppose that some cadets, seeing no fair prospect of a commission, would become discouraged and cease to pursue their studies with diligence. There is testimony tending to show that, in some degree, this is true. The Board believes that the value of the course of instruction, both to those who reach graduation and to those who fail of graduation, is impaired by the painful smallness of the number of those who can reasonably hope to attain positions in the naval service.

While it appears that the morale, discipline, and scholarship of the Academy have improved in the last four years, yet the Board is confident that the intense competition which necessarily arises under the operation of the act of 1882 is inconsistent with an altogether healthful pursuit of the studies of the course.

It would be very desirable for the Government to find, if practicable, occupation for more cadet graduates than are now taken annually into the naval service. It seems to the Board that Congress might well consider the propriety of putting these young men, so far as may be, in the revenue marine service, filling all vacancies there by appointment from the graduates of the Academy. These would be so many more prizes for diligence, and certainly it would not be an undesirable thing to have naval officers acquire the knowledge of our coasts and approaches that would be attained in that service, the duties of which require constant watchfulness over every avenue and landing by which an enemy could approach from the sea.

If the number of those who are to be received into the service can not be increased, it would, in the judgment of the Board, be better that a much smaller number should be admitted into the Academy.

#### SUBJECTS OF STUDY AND STANDARD OF SCHOLARSHIP.

The Board finds:

(1) That no subject of study is embraced in the present course which is not essential or highly important in the education and training of naval cadets, under the general system prevailing.

(2) That the proportions according to which the aggregate time at the disposal of the academic board has been divided between the several subjects of study are, in general, very judiciously taken.

(3) That no subject which can be deemed essential to the proper education and training of naval cadets, under the general system prevailing, is now omitted from the course of instruction, excepting only international law, and the Board is unanimous and earnest in the opinion that this branch of study should be held to be absolutely indispensable.

Believing that it is not advisable to add anything to the present weight of studies in the Academy, it recommends that room be made for this branch of instruction through a reduction in the volume of work in this or some other department.

(4) The Board finds that, while the course of study at the Academy

vere, as it ought to be, the requirements of instruction are not excessive. After careful consideration the Board is satisfied that the demands upon the time and strength of the cadets are not greater than consistent with health and mental soundness.

The Board's observation of the cadets, as well as the testimony of the medical officers of the Academy and other members of the corps of instruction, shows that the young men pursuing these studies are vigorous, active, vivacious, with a degree of mental spontaneity and physical alertness which could not be exhibited by men who had habitually been overweighted or kept under undue strain.

The Board notes, with gratification, the instruction given in the mechanic arts, and hopes that opportunity will be found for a large extension of these studies and exercises during the summer or otherwise, and the introduction of the cadets into the shops at an earlier period of the course.

#### GROUND, BUILDINGS, AND SANITARY CONDITION.

The Board heartily indorses the report of the Board of Visitors last year as to the excellent condition of the grounds and buildings; cleanliness and order are everywhere observable, and the good health of all at the Academy bespeaks its sanitary condition.

As recommended last year, a new boat-house for the storage of the steam-launches and boats has been appropriated for by Congress and is now being built. There is also in course of construction a new brick building to be used as a sail and rigging loft. This will do away with use of the present frame building on the dock and lessen the danger of fire. These buildings will serve a useful purpose.

The Board again recommends that some use or disposal be made of the unused hospital building. It thinks that if no use can be found for the building by the Government the same should be sold.

The additional land adjoining the Academy grounds, for the purchase of which Congress provided at its last session, has not yet been bought, owing to the fact that the owners demand a larger sum than was appropriated for this purpose. Measures are now being taken to condemn this land to Government use under due process of law, and at a price to be thereby fixed.

The Board has been impressed, as were its immediate predecessors, by the necessity for additional houses for officers detailed for duty at the Academy, many of whom are now obliged to live, at no little expense, outside the Government reservation; therefore the Board unanimously recommends that additional quarters be furnished for the instructors of the Academy.

#### SEAMANSHIP, ORDNANCE, AND NAVIGATION.

The Board witnessed, with much interest, the drills and exercises of cadets in practical seamanship on board of the *Wyoming*, the target practice with great guns on board the same ship, and the artillery and entry tactics on shore.

In the exercises on board of the *Wyoming* the ship was gotten under way and steamed to a favorable position in the bay, the cadets performed all the duties usually required of seamen and the forces of the engine and fire rooms.



The exercises in making and shortening sail, sending up and down light masts and yards, and in the ordinary evolutions of handling ship were performed in a very satisfactory manner and with commendable spirit. The cadets labored under great disadvantages, due to the heavy spars, old-fashioned blocks, and poor-fitting sails. Such obviously imperfect appliances will not probably exist when the practice ship, already appropriated for, is completed. That ship should be of the most modern type in all departments; she should be square-rigged on at least two of her masts, and she should have an extra suit of sails especially for exercises.

In the department of ordnance the practical work shows evidences of careful training. The drills of artillery and infantry were creditable to the instructors as well as to the cadets. The target practice from the *Wyoming*, when under way, was most excellent in details and results. The regulation target was anchored, and the ship maintained a position about 1,200 yards from the target. The target was struck frequently and of the many shots fired, but few, if any, would have failed to strike a small-sized vessel. It was particularly observable that the training and instruction of the cadets had been such as to give them that perfect confidence in their guns which is essential to good gunnery.

#### DISCIPLINE, DRILL, PRACTICAL EXERCISES, ADMINISTRATION, AND POLICE.

The discipline of the Academy is all that is required for a high end of military training. The regulations are necessarily exacting, but are so enforced by those charged with this duty as to establish pleasant relations between them and the cadets. The example shown by the officers of the Academy has a beneficial effect in this respect.

The amplest opportunities were afforded the Board to judge of the proficiency of the cadets in their various drills, which was found to be most gratifying and satisfactory, all movements being executed with the precision resulting only from a thorough personal understanding of the subject.

The system of practical exercises which has been adopted is commended, and in the matter of administration and police, after careful investigation and consideration, no changes suggest themselves.

#### STEAM, MATHEMATICS, PHYSICS, AND MECHANICS.

The reorganization of the course of study and practice at the Academy in virtue of which those who enter the Engineer Corps of the Navy are selected at the end of the third year of their course, and are provided with special studies and exercises during the fourth year, makes it imperative that the facilities for work in steam-engineering be enlarged and amplified.

The equipment now available in this department, although excellent in its way, is much of it obsolete. Marked improvement in the construction of marine engines and boilers has been made since this equipment was supplied, and young men well drilled in the use and construction of the steam apparatus now at hand, would find themselves quite unable to manage easily and successfully the best engines of modern construction which are being placed in the new ships. It is, therefore, very important that a new triple-expansion marine engine, of the best type,

for the use of the department, and that the boilers now in use be  
ed by those of modern construction.

ie arrangement should also be made for absorbing the power of  
ngine by submerging the screw, if possible, or by other available  
od, so that the engine may be worked under conditions similar to  
obtaining at sea.

is also believed that the addition of a small stationary engine, es-  
ly designed and constructed for purely experimental purposes,  
a be of great value. With it should be provided suitable dyna-  
sters for measuring its available horse-power; apparatus for carry-  
evaporating tests, fuel tests, etc. Additional appliances are also  
ed for the better study of the properties of steam.

e machinery and equipment of the machine-shop are good and prob-  
sufficiently complete for the demands likely to be made, but the  
ties for wood-working should be enlarged, and it should be sup-  
with power. The blacksmith-shop should also be supplied with  
zer-blast for the forges.

practical exercises of the cadets in the work-shops furnish evi-  
of excellent instruction and emphasize the importance of this  
re of their course.

ne modern war-ship is a vast and complicated machine. She is  
lled by machinery, steered by machinery, her guns are loaded,  
ed, and fired by machinery. The mechanism by means of which  
his is accomplished is intricate and often delicate, and its various  
nts are so related to each other that failure, although but tem-  
y, of an apparently unimportant device to properly perform its  
ions might lead to a complete paralysis of the whole.

his fact makes the possession of mechanical ingenuity and skill one  
be important qualifications of a successful officer, and it, therefore,  
s to this Board that the cultivation of manual dexterity through  
k-shop practice might well be begun earlier in the course than at  
ent, and a somewhat larger proportion of the summer devoted to  
The effect, both primary and secondary, of such practice is good,  
its influence upon the work of the cadet in other parts of his course  
not fail to be beneficial.

he circumstances under which the Board visited the Academy ren-  
l an actual inspection of the methods in use in the various depart-  
nts of instruction impossible. Without such actual inspection it is  
ossible to speak with certainty and confidence regarding the  
hod. It is the sense of the Board that it would be well that a cer-  
number of the Board of Visitors be designated to come to the  
emy prior to the closing week of the academic year and examine  
ork in progress. Much information was gained, however, by in-  
tews with the heads of these departments, and by the inspection of  
nation papers. Knowledge thus gained has led to the belief that,  
main, the instruction is thorough and efficient.

ne course in mathematics is extensive and exacting, but not un-  
sarily so, since it is the foundation, upon the integrity of which  
is a large share of the professional culture of the cadets. The  
ruction given is, in the main, excellent, but the scheme adopted in  
vision of the cadets into sections, and the subsequent instruction  
se sections, is one of which the Board can not approve. While  
ant to express opinions in strong condemnation of methods which  
have received the approval of the Academic Board, it can not  
n from declaring its belief that any system which restricts the

instruction of the head of the department, naturally more experienced and capable than his assistants, to that section of the class which is highest in scholarship, is false in principle and pernicious in practice, under the conditions which exist at the Academy.

The advantage which, in the very beginning, is thus given to students who may enter a little ahead of their fellows, or who are a little more ready in recitation, or whose memory is more retentive, is likely to be held through the system of daily marks and averages, to which undue prominence may be given.

The existence of this system is, unquestionably, one of the reasons why so small a proportion of a class is graduated. In the judgment of the Board the so-called "electives," which are really "extras," should be given up so far as they take the form of recitations upon which marks are given which are allowed to tell upon the cadet's rank. Such time as can be spared by the better scholars should be devoted to practical exercises or to recreation.

The department of physics is, for the most part, well equipped, and as far as known to the Board the methods of instruction are in agreement with those adopted by the best institutions of learning. The subject is of great and growing importance to the naval officer, and an increase in the facilities for instruction along certain lines is demanded.

The extensive application of electrical apparatus on board ship for lighting and other purposes calls for the establishment at the Academy of an electrical plant similar to that in use on the best equipped vessels, so that the cadets may become practically familiar with its management. A lighting plant for certain of the buildings of the Academy, notably the study-rooms of the cadets, would not only be desirable on general principles, but would also be a valuable addition to the facilities for instruction in the physical department.

The system of change in instructors by detail from the active service of the Navy, while possessing advantages in some departments, is not calculated, in the opinion of the Board, to produce the best results in such a rapidly-expanding department as that of physics, and it is therefore recommended that a permanent assistant to the head of this department be provided for.

The course of study in applied mechanics is complete and thorough, but the addition of some appliances for the experimental study of the laws of elasticity, the elastic limit, elongation, and torsional rigidity of materials used in construction would be very desirable.

#### ENGLISH STUDIES, MODERN LANGUAGES, DRAWING, PHYSIOLOGY, AND HYGIENE.

The work in these departments, as evinced by the results presented to the Board, has been well conducted, when the narrow limits of time allowed are considered.

#### FINANCE AND LIBRARY.

The finances of the Academy seem to be well administered, the books correctly kept, and the system of checks and balances adopted to prevent improper expenditures appears to be efficient, and the interests of the Government and the cadets are carefully guarded, and the system of accounts adopted during the last winter works admirably.

the library is well arranged, neatly kept, and is, altogether, well aged. The new building is admirably adapted to the purpose for which it was built and will afford ample room for many years.

Very respectfully, your obedient servants,

GEO. BROWN,  
*Commodore U. S. N., President.*

M. C. BUTLER,  
*U. S. Senate, Vice-President.*

H. M. TELLER,  
*U. S. Senate.*

H. A. HERBERT,  
*House of Representatives.*

WM. MCADOO,  
*House of Representatives.*

FRANCIS A. WALKER,  
*President Massachusetts Institute of Technology.*

T. C. MENDENHALL,  
*President Rose Polytechnic Institute.*

L. C. GARLAND, LL. D.,  
*Chancellor of Vanderbilt University.*

OREN ROOT,  
*Professor of Mathematics, Hamilton College.*

STEWART L. WOODFORD.

JOHN B. F. TRACY,  
*Secretary of the Navy.*

## APPENDIX.

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COMMANDANT'S OFFICE, NAVY-YARD,  
*Norfolk, Va., August 14, 1889.*

SIR: In accordance with a resolution of the Board of Visitors to the Naval Academy in June last, of which Board I was president, I have the honor to submit the accompanying papers as an appendix to the report of the Board.

Very respectfully, your obedient servant,

GEO. BROWN,  
*Commodore, U. S. Navy.*

Hon. B. F. TRACY,  
*Secretary of the Navy.*

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U. S. NAVAL ACADEMY,  
*Annapolis, Md., June 4, 1889.*

The Board of Visitors was called to order at 8.37 o'clock p. m., by Commodore Brown, U. S. Navy, president, presiding.

Present: Commodore George Brown, U. S. Navy, president; Senator M. C. Butler, U. S. Senate, South Carolina, vice-president; Senator H. M. Teller, U. S. Senate, Colorado; Hon. H. A. Herbert, House of Representatives, Alabama; Hon. William McAdoo, House of Representatives, New Jersey; Prof. Oren Root, Hamilton College, Clinton, N. Y.; Dr. T. C. Mendenhall, president Rose Polytechnic Institute, Terre Haute, Ind.; General F. A. Walker, president Massachusetts Institute Technology, Boston, Mass.; L. C. Garland, LL. D., chancellor of the Vanderbilt University, Nashville, Tenn. Commander P. F. Harrington, U. S. Navy, commandant of cadets, was present.

Commander HARRINGTON was interrogated as follows:

By the PRESIDENT. The act to regulate the course of the Naval Academy, approved March 2, 1889, has been referred to by the Superintendent, Captain Sampson, who has pointed out certain objectionable features in this act. Have you given this matter any consideration?

Commander HARRINGTON. I was chairman of the committee of the Academic Board which prepared a report to the Secretary of the Navy two years ago, from which report this act originated. The modification of the law existing prior to the passage of this act desired by the Academic Board included the abolition of the two years' course at sea. I have always been a strenuous advocate of that idea. If the Board desires, I could give my views about this matter, but they are embraced in the report.

The PRESIDENT. The Board would like to hear your views.

Commander HARRINGTON. At the end of the four years' course, the cadets who are eligible to appointment in the Navy have already had a professional course sufficiently extended to determine their disposition as well as their qualification for the naval service. Those who are not eligible under the present law have acquired a method and system of study, a mental process which fits them to go into work in any other profession or business, of course after a preliminary study in such business or profession.

The two years that they spend at sea is worse than lost to them, while it is of no use to the Government. On the other hand, and looking to the interests of the Government, they have acquired so much taste for naval life as would probably determine their return to the service at a subsequent period, in the event of war, if their services were needed. It seems to me that on any ground of benefit to the Government, or benefit to the young man, the two years' course subsequent to graduation is useless. As a matter of economy the Government would save about \$30,000 a year by the abolition of the two years' course at sea.

Again, the graduates of this school, under the former law, averaged about twenty-

ars of age at graduation. That will be increased nearly one year, the average of entrance having been seventeen years and three months, which will be to about eighteen years under our present law. Twenty-two years is too old an age to go to school two years longer at sea, and to perform subordinate duties—which are not strictly of a progressive character—such as taking charge of a rowing-boat in the morning, etc. But such, to a large extent, is the work given to younger graduates of this school. I think it desirable that they should be commissioned upon graduating at the end of four years, and placed at once in suitable positions; placed in charge of guns, and of the numerous pieces of machinery installed in modern war vessels.

It is probable that steam auxiliary engines will, in all probability, give way to the electric for various uses; that the latter will be used for much work in our ships, and the attention of the graduates of the schools should be taken up largely in acquiring a practical knowledge of them. The Academy fits its graduates to undertake the more arduous and to continue these studies; and it seems to me that the workers ought to be rewarded and dignified with a commission, and so excite their ideas of responsibility, that would be akin to the course at West Point. The two years' course at the Academy is repressive.

Senator BUTLER. Then you think the two years' cruise is of no benefit to them or to the Government?

Commander HARRINGTON. It is of no benefit to either. The young men return to the Academy, pass an examination, which is but a résumé of their former graduating examination. There is little of progress in the second (or final) graduating examination.

Representative McADOO. Do many changes occur in the standing of cadets after returning from the sea voyage?

Commander HARRINGTON. In a few cases they rise or fall five or six numbers. The changes are generally small and are nothing more than accidental, and due to the system of marking.

Representative FARLAND. Do they apply themselves on board ship to the studies which occur in the Academy?

Commander HARRINGTON. As commander of a ship, where I had opportunity to observe the cadets received from other ships, I have come to the conclusion, from observing them, that the matter of study of cadets on board ship is largely a matter of opinion they receive from the commander or executive officer. It depends upon each case; which the captain of the ship takes in them, rather than the energy of the cadets.

Illustrate: I required a cadet to ascertain from the chart what time we should reach high water on the next day, and after half an hour's work he was unable to tell me. I put him to work and eventually he passed, but passed too low to be appointed. I think that cadets on board ships during the two years do not study. I think when they come back here they sit down for two or three weeks and cram themselves for the next examination, which is not very different from the examinations they have at this school. You, gentlemen, can test that by comparing the papers of the examinations. I don't think your question can be answered in the affirmative. Cadets do not study much at sea unless compelled by their captain.

Representative HERRICK. Are many changes made usually by the examination at the end of the two years at sea? I mean, is it often the case that a man who does not stand high enough to get a commission before going to sea does stand high enough to get his commission when he comes back, by reason of getting ahead of somebody?

Commander HARRINGTON. I think you would find one change every year. It is probable that some years there may be more; but I regard that to a large extent as an accident of the examination. I will give an example: A young cadet was here a few weeks ago and came to me, saying he had done badly on one examination. I inquired what the trouble was. "I was puzzled on one question," he answered. "I spent too much time on studying that question, forgetting my old academic rule to 'leave the easy problems first.' I found a great deal of time had passed before I had finished the first question, and had not time to finish." That examination probably was a poor one. He would have had a little higher mark but for the accident of examination, and I think it illustrates the idea that cadets make or lose a number of places by headache, sickness, or through the luck of having questions with which they are not so familiar, while they might be puzzled by questions on other parts of the subject.

Representative HERRICK. Are changes ever made by the differences in seamanship, arising from study during the two years' cruise? When we had this question before the House it was urged very strenuously that the two years enable the young men to fit themselves as seamen. Do you think there is anything in that?

Commander HARRINGTON. I think you will find that cadets come back and change in different studies; but not in a large degree.

Representative HERRICK. But in practical seamanship?

Commander HARRINGTON. I am unable to tell you whether they do or not. I think it would necessitate a recourse to the records to determine whether that is so or not. I think the cadet's experience in practical seamanship is not sufficiently extended in the school.

Representative HERBERT. My question is whether that two years affords any valuable criterion, and whether it makes any practical difference in the cadet's standing.

Commander HARRINGTON. That brings in the matter of opinion. I will say that of reports we receive from commanding officers of vessels some exhibit good judgment in marking cadets, while others exhibit a want of care that is very near to indifference. I have seen a private letter from one commanding officer complaining of a cadet, while his official report marked him high. The course of commanding officers toward cadets has been a matter of comment during the last twenty years. Some captains watch their cadets very closely, others do not. Some officers have no judgment concerning the cadet's capacity to make a good officer. Every naval officer has been surprised upon hearing some one say such and such a one is a good officer, when he had condemned him. Such reports can not be compared with examinations as a means of determining a cadet's merit and proficiency.

Representative HERBERT. So you do not give a great deal of weight to these reports, because you can not consider them always reliable?

Commander HARRINGTON. They have not the confidence of the Academic Board.

Representative HERBERT. And, for that reason, you do not consider the two years' course beneficial?

Commander HARRINGTON. That is a *non sequitur*.

Representative MCADOO. Suppose there were fifteen vacancies and there was a class of thirty at sea, the sixteenth man might be highly recommended by his commanding officer. Would that recommendation change his standing as against his papers?

Commander HARRINGTON. No, sir; it would not. It would only modify it in a small degree. I suppose you have seen the formula. He would get the benefit in that slight degree. I would say that the judgment of the officers of the practice ship, under the system adopted two years ago, I consider as determining the merit of the cadet better than any other method that can be adopted during their two years at sea. You have the judgment of the teachers at this school, marking them every day. I could give you, very briefly, a statement of how this thing is done. I will instance a case on board the practice ship I commanded last year. The moment we left port the cadets were notified when the course in seamanship would begin. Five officers were assigned to mark them on their daily lessons. They were required to take the deck themselves and handle the ship; to perform the duties of seamen and all duties pertaining to the officer, and each officer was required to mark for the lesson each day, and twice a month to mark on the cadet's general bearing and personal characteristics.

The work of the cadet each day was examined by the officer to whom he was assigned, and the errors marked with a blue pencil underneath. The cadet was required to ascertain what that error was and to correct it with additional notes. After marking for twelve weeks an average was struck. An examination was then held, the questions being drawn from the work that had been done, and this combined with the weekly marks and the judgment of the officers upon aptitude to determine the cadet's standing. In my judgment that is about as close as we can get to the personal worth of these gentlemen as seamen.

Dr. GARLAND. How far was that average mark made to bear upon the general average, including their studies here?

Commander HARRINGTON. It is one-fourth of the entire course in seamanship. In other words, it gives a cadet position if he happens to be an excellent practical seaman. That proportion was proposed by myself two years ago, and I have had no reason to wish to see it increased. It is two years since I left the department of seamanship, so that I can not speak with certainty regarding the attitude toward the matter now. I believe Commander Sigbee, whose attention has been directed more closely to this matter, would give the information required concerning it.

Senator BUTLER. When did you graduate?

Commander HARRINGTON. In 1863.

Senator BUTLER. Could you give the Board any idea of the studies of that day as compared with the present?

Commander HARRINGTON. The comparison would be a marked one. The studies now are entirely different. They are more comprehensive. They embrace a great many subjects that were not taught in my day. I should say it requires a greater effort than it did in my time to graduate. I was here in the beginning of the war, when the Government wanted to get officers and pushed cadets into active service.

Senator BUTLER. Can you give the board any information as to what the course was prior to that?

Commander HARRINGTON. The course prior to that included moral science, which we do not teach now. There was a light course in international law, and a light course in mathematics, as compared with what we have now.

Senator BUTLER. The time has not been extended for the mastery of the additional studies?

Commander HARRINGTON. The time allowed is exactly the same. The amount of time has never been changed. The number of months and hours is the same as thirty years ago.

Dr. GARLAND. You must, then, have studied more thoroughly in former years?

Commander HARRINGTON. I may qualify my answer by stating that formerly part of that time was given to practical work, which is now devoted to theory.

Dr. MENDENHALL. Were the conditions for entering the same as now?

Commander HARRINGTON. Our examination has increased, but in no very great degree. As you ask me that question, I will say I am partially responsible for this change. As chairman of the committee, in 1882, I advocated an examination in algebra.

The PRESIDENT. Prior to that time how far did you go in mathematics?

Commander HARRINGTON. Arithmetic only was required.

Dr. MENDENHALL. Do I understand the examination in arithmetic is not more difficult? It is simply the addition of algebra?

Commander HARRINGTON. In making that addition, it was provided that the examination should be drawn from a certain book (Ray's Higher Algebra), the examination being drawn entirely from the first pages, including algebraic equations of the first degree, involving one unknown quantity, such as school-boys accomplish at sixteen or fourteen years of age. One year ago it was seen that every problem in those pages was so fully known that it could not really test the knowledge of the student. They could be memorized. Then different questions were given, drawn from the same principles.

Dr. MENDENHALL. Do I understand the questions were actually taken from that book?

Commander HARRINGTON. Yes, sir; but they are no longer so selected. They used that it was a "soft snap" for the boys. The preparatory schools would get fellow through by force of memory, when he really didn't know anything about algebra.

The PRESIDENT. How do the examinations twenty-five years ago compare with those to-day?

Commander HARRINGTON. The effort then was to get everybody through on account of the war.

The PRESIDENT. Well, say, twenty years ago?

Commander HARRINGTON. I don't think I can answer that question precisely, but believe that the entering examination is now more extensive.

Dr. MENDENHALL. Could you get the statistics for the last twenty years and bring them up to date without any great trouble? Is there a record?

Commander HARRINGTON. There is a perfect record.

The PRESIDENT. We can call upon the Superintendent for that.

Commander HARRINGTON. I would suggest that Professor Hendrickson will provide on with that information.

Senator BUTLER. As commandant of cadets you have had an opportunity to observe the course pretty closely, and of course have the interest of the place at heart, as we all have; I would be very glad if you would give the Board the benefit of your judgment whether you think the course is too severe. That is to say, whether too much included in the four years for the ordinary boy, the average American boy.

Commander HARRINGTON. I would like to begin an answer to that question by referring to my experience as head of the department of navigation. I was there four years, having been there previously as teacher during three years, and my observation was that any lad of fair ability who had also fair application to his studies could accomplish the course in that department, but any relaxation of attention to study for a month or so would put him in a very bad strait, and, if more prolonged, would be fatal to success.

The PRESIDENT. That was how long ago?

Commander HARRINGTON. I left that department three years ago. It is now the same when I left the department. There is but one difficult study in that department, and that is the study of the mathematical theory of compass divisions; but in the last six or seven years I don't think there have been more than three or four who have not been able to accomplish that study. I mean in the aggregate.

Senator BUTLER. Can you give any information as to the other departments?

Commander HARRINGTON. In the department of seamanship, of which I was the head for one year, it has been very seldom that a cadet has been found deficient and rejected. In both these departments, upon the final examination, cadets have occasionally been found deficient and rejected, but not since the present law went into



force. Immediately prior, it used to be done. That is due to causes that don't to your present inquiry.

Dr. GARLAND. We want to hear your opinion on the question of students being heavily burdened with study.

Commander HARRINGTON. I could not advance an opinion in regard to the duty of other departments with very great confidence. I don't know those, what is being done in them, as I do in the departments I have taught in. I can give my general opinion that cadets of fair ability who are persistent and regular in their studies and attentive to the duties of the different departments can pass our examinations. Those who fail generally have one or more examinations, and I have often known that they have failed in those re-examinations for want of study, want of attention to their work. Last year, on board the practice ship, there was a number of cadets who were directed by the Academic Board to be re-examined in September. As commanding officer of the ship I was very anxious to help them, I relieved them from the practical duties of the ship from 1 to 6 o'clock daily, turned the forward cabin into a study room, and gave them instructors to prepare them for examination and required study. That was kept up for two months and a half, and they came back and passed their examinations. Not one failed.

The moment a cadet begins to drop, I can find a cause for it. In dozens of cases there is no doubt. Very often there is a lady in the case. They get interested in a girl and they quit their efforts. They can not pass their examination, and we have nothing to do but to turn them out. That happens here. I think the examinations as I have been able to observe them are fair. I don't know as I am qualified to say in some departments, it seems to me, the examinations are hard. I have judged them, however, rather by the results of a single examination, where a large portion of the class have been marked low, and I have drawn the inference that the examinations there are too long or too difficult; but that was merely an inference, and not a judgment with full knowledge of what the examination was.

Senator BUTLER. I was going to ask you whether there is any improvement in character and ability of the officers of the Navy under this new system of examination and study which you say exists now, as against the officers of thirty years ago.

Commander HARRINGTON. Perhaps it would not be becoming to say the young officers are better than I am, and that I am better than Commodore Brown; but I think the officers of to-day enjoy a great advantage. I think the country is getting the benefits of our present education. The course here, while high and thorough, induces a high superiority, and that is because we supplement every piece of the by an immediate application of the principle. Our teaching is object teaching; the result is, the men are doing good work in all branches of the Navy. There is no department connected with our service that has not honored this school and been great usefulness to our country. I don't think it possible to obtain that result with a course that is not scientific as this is. This course may be hard on some young men but it is necessary to meet the wants of the Government.

Senator TELLER. Is it true that students from parts of the country where educational advantages are lacking are more backward than those from education centers?

Commander HARRINGTON. If that should happen in one case, I should judge an accident. I think that our records do not show that some parts of the country where educational advantages do not exist send boys less able to hold their places in the classes. We have some young men from sections charged with being deficient educational advantages who reach the top of their class. We have one now from Nashville.

Senator TELLER. But that is a city. How about those from Congressional districts in which there are no towns?

Commander HARRINGTON. Captain Sampson was from Palmyra, N. Y.

Senator TELLER. But they had pretty good schools there long before the case went to the public schools.

Commander HARRINGTON. I think the upper cadets in the upper classes absorb this course easily, and a tremendous competition between them is brought about by the law of 1882, which induces them to go into the elective courses and compels them to work, so at the top of the class we find the cadets all workers. They do many cent work.

Senator BUTLER. What do you think would be the effect of moderating the curriculum of the course here under which more young men would graduate and make officers and at the same time establish a post-graduate college for those who have special aptitude for scientific studies, the higher branches of mathematics and studies requiring special adaptability? What do you think would be the result of that change? I agree with you when you say you would be very sorry to see studies lowered here. This is a national representative institution. It is true for specific purposes. What do you think would be the effect of moderating the course here, bringing it back to what it was twenty years ago, and establish

school of higher standard where young men might take post-graduate courses in scientific departments?

Commander HARRINGTON. It seems to me the first result of a change of that kind, to take the school back to what it was twenty years ago, might result in giving you two or three more men a year in the Navy, but that is a question you can determine from the records.

Senator TELLER. Perhaps it is not fair to say to take the school back to what it was twenty years ago, but to modify it.

Commander HARRINGTON. Congress, two years ago, introduced a course of hygiene and physiology into the Academy.

Senator TELLER. Congress introduced it?

Commander HARRINGTON. Yes, by a statute. That was regretted by the Academic Board, as it was simply putting an additional burden on the cadets.

Dr. GARLAND. You don't lessen the labor in other departments, do you, because of this?

Commander HARRINGTON. No, sir. Senator [addressing Senator Teller]. I don't know how to carry the course back to 1872. It will be a very difficult task. Where will you cut off? Shall you say not study electricity, or acquire less mathematics, or not take so extended a course in steam? I don't see how we are going to cut off anything we have now. It is true, there are some minor studies, but they appear essential to a good general education.

Senator BUTLER. What would be the effect of extending the time to accomplish that which is now accomplished?

Commander HARRINGTON. I think a few more cadets would accomplish it, but how many, of course, I can not judge. I expressed my opinion a little while ago; I believe the cadets who fail fail for causes which are not, to any extent, a fault of the system.

Dr. GARLAND. Would that not have an injurious effect upon those who are your best scholars, while it would be favorable to those who are lowest? You extend the time to bring the accomplishment of the course within the reach of your poorest scholars. What would be the effect upon the interest and energy of your superior scholars?

Commander HARRINGTON. It would be impossible to give an answer; I can not judge the effect, but I think the suggested one probable.

Dr. GARLAND. It is a great blessing for boys to have their hands full.

Commander HARRINGTON. The cadets don't have too much to do. My objections are, that the athletic and practical want development. I should like to see the cadets have a little better development of athletic work. We give them time, but they use it in social pleasures.

Dr. GARLAND. I suppose they have no time for general culture?

Commander HARRINGTON. They have Saturday afternoon and Sunday. The majority are devoted to their studies, and don't have much time for general literature. A year ago, when I became commandant of cadets, I inquired into the subject of the amount and character of literature they read, and eventually required each cadet to submit to me a list of books in his room. I examined them and reported to the Superintendent, with the recommendation that cadets should not be allowed to keep certain books. The great majority of the books were utter trash.

Dr. GARLAND. Under which our press is groaning.

Commander HARRINGTON. I have often found the cadets reading this literature. Now it costs the cadets five demerits to have one of those books in his room without permission; and they don't keep books in their rooms unless they are proper ones.

Senator TELLER. Can he take any book from the library?

Commander HARRINGTON. They may take any book. They do take novels, and you can find what class of books the cadets read from the library records. On board the practice ship they had an attack of dime novel fever, and I had to throw a good many books overboard.

Representative McABOON. In consequence of the modern vessels, does it not require a higher standing to be a naval officer now than formerly?

Commander HARRINGTON. The amount of intelligence required is more diffused. It embraces a greater number of topics. One of the extra branches is in the study of steel; and our cadets acquire proficiency in testing steel, so that at this moment forty, fifty, or a hundred are competent to do the work required by the Government. There are many other necessary studies not formerly essential to a good officer.

Representative McABOON. You educate them to manage a ship?

Commander HARRINGTON. That is to make a ship officer. We don't teach the art of war. The school simply teaches them to manage and fight a ship and its batteries; and by that I mean its torpedoes, guns, and all the machinery of naval warfare.

Representative McABOON. Do you think it a wise thing to wait until the third year before beginning to teach seamanship, and the fourth year before teaching gunnery?

Commander HARRINGTON. We do not wait until that time. In their practical instruction they are beginning the study of seamanship and gunnery and kindred practical studies from the day they enter. It is true they don't take up the study in books. But seamanship, naval construction, and gunnery are now all taught very largely through the medium of mathematics. In my day it was not so. Seamanship was more of a practical study, while the seamanship of to-day is more of a mathematical study, and cadets are not ready to take up the book study of seamanship and gunnery immediately upon entering the Academy.

Representative MCADOO. That makes it plain. I see you do teach it during the four years.

Commander HARRINGTON. We don't teach the theory of gunnery before they have acquired a full course of mathematics. I must say the study of seamanship and gunnery has been driven forward, partially from that cause and partially from the study of other subjects.

Representative MCADOO. Do you consider the construction corps and the engineer corps very important to a new and modern navy?

Commander HARRINGTON. I think the construction corps is very important; the engineer corps also, but in a less degree.

Representative MCADOO. Have you any suggestion to make about the corps of construction?

Commander HARRINGTON. You know, in foreign navies, the construction corps is a corps for special purpose, and does not take any part in the practical running of the navy. We are now building up our construction corps on a plan which has been found beneficial in England, France, and other countries. We have the study of steam engineering as part of our cadets' training for the construction corps; not in the sense of handling machinery, but in the designing of machinery.

Representative MCADOO. And is that study elective?

Commander HARRINGTON. No. In the English and French navy the corps of design and construction designs all ships.

Representative MCADOO. Now that we are building ships, we could start a special corps in the Academy, as we do with engineers, being a corps of engineers for construction.

Commander HARRINGTON. I think we are doing it better in the present way. It must be a limited corps, and we now select the best men to take the special course abroad, under the direction of the Secretary of the Navy. We get the best men in that corps.

Representative MCADOO. Then you send some of the young men for duty at the yards?

Commander HARRINGTON. We have one student here. He is on duty, perfecting himself in the profession as a constructor.

Dr. MENDENHALL. Do these selections come from the engineer corps or the line?

Commander HARRINGTON. They have come from both sources. We have selected them often from those who are naval cadets. Under the former law they were selected with regard to ability, rather than in regard to the special corps to which they belonged.

Dr. GARLAND. Is there now left any preference for the men, whether they shall be selected or not?

Commander HARRINGTON. The Academic Board has not regarded the desire of the student.

Dr. GARLAND. How many are there in the construction corps?

Commander HARRINGTON. There are twenty.

Representative MCADOO. As the older men go out of the corps the young lieutenants take their places, do they not?

Commander HARRINGTON. Yes, sir. About nine of the old ones are left. Of the eleven younger officers of the construction corps, some entered the Naval Academy as cadet engineers and some as cadet midshipmen. There are eight of the former and three of the latter.

The PRESIDENT. The majority of them were cadet engineers. [Speaking of those entering the construction corps.]

Senator BUTLER. Do they lose their rank in the Navy by going into the construction corps?

Commander HARRINGTON. They are given new commissions with increased relative rank.

Representative MCADOO. They are higher than their classmates, with whom they have graduated. The Secretary of the Navy makes the selection, does he not?

Commander HARRINGTON. The Academic Board selects, for the Secretary of the Navy, three or four cadets for appointment to the corps, and from them he selects one or two, or as many as he needs.

Senator TELLER. Are they given in any order of preference? Which stands first?

Commander HARRINGTON. Yes; the Board names them in order of preference.

**Representative McADOO.** We have some very good young men in that corps now. **Commander HARRINGTON.** I would like to say, in regard to the practical seamanship and navigation, that I think it would be an advantage to this school to increase the amount of time given for their study. I think our practice cruise should last all summer, and I think the one month's leave every year is demoralizing in many respects.

**The PRESIDENT.** That is a mere matter of regulation which the Secretary of the Navy can change.

**Dr. MENDENHALL.** Would the new arrangement, if a corps of construction were established, change to any extent the studies of these young men from those of other cadets?

**Commander HARRINGTON.** They remain naval cadets under similar discipline and occupying positions exactly the same, the only difference being in the course of studies they pursue.

**Dr. MENDENHALL.** The only difference is whether the corps is better calculated or more likely to furnish the proper men for naval construction than the corps as it now stands. Do you consider that the course the engineers now have is the best to them for constructors?

**Commander HARRINGTON.** I presume that the cadets who study for the line will have a more extensive course in electricity, torpedoes, gunnery, etc., while the additional studies for the engineer corps, which will be a more extensive course in drawing, designing machinery, and in heat, the latter course would tend to develop knowledge of naval design, which would fit them better for the construction corps.

**General WALKER.** Does it place their mathematical studies higher?

**Commander HARRINGTON.** No; they are the same for both branches of the service. Knowledge of mathematics is equally necessary for the line officer, the engineer, and the constructor.

**Representative McADOO.** Do they have instruction for the construction corps? [Speaking of the English and French schools.]

**Commander HARRINGTON.** I think they rarely go to sea. At the English and French schools they are stationed at the dock-yards, and, after taking their course, never go to sea.

**Representative McADOO.** Do the young men of our Navy who study abroad subject themselves to the same examinations as do foreign students?

**Commander HARRINGTON.** Yes, sir; they are granted the same privileges as the cadets from other countries, and they bring home much information about the dock-yards and the practical workings of the institutions which they are in the course of their studies permitted to inspect.

**Senator BUTLER.** Why should we not have such schools as these, instead of sending boys to English and French schools?

**Commander HARRINGTON.** They have a very large number, and we educate a very large number. The English and French schools are each of a different character. The Polytechnic is a preparatory scientific institution, while that at Cherbourg (Ecole L'Application du Genie Maritime), is of a more practical character and intended to supply constructors for ships and engines.

**Senator BUTLER.** Do you know how long the terms are at those places?

**The PRESIDENT.** Two years at Cherbourg; after two years, at the Polytechnic.

**Representative McADOO.** How is it in the English school?

**Commander HARRINGTON.** There is a naval college at Greenwich. A great many officers attend from all corps, and these officers take special courses in gunnery, steam engineering, torpedoes, naval construction and architecture, etc. I met a captain of the English navy some years ago in China, as he was about going home. He said: "I will go to the Royal Naval College and get a first-class certificate, in the hope of being a command," and he got it. They have post-graduate courses there and the officers are obliged to pass certain examinations before they get their commissions. They have three grades, first, second, and third, indicating the relative proficiency of graduates.

**Representative McADOO.** I believe the system in England or in the English navy is the reverse of that in vogue here. There, they first place the boy on ship and afterwards send him to college.

**Commander HARRINGTON.** They have studies on shipboard, however, for the cadets.

**Representative McADOO.** Is it optional for the English officer to go to the college at Greenwich?

**Commander HARRINGTON.** If he desires advancement he must take a special course. It is not optional. They must go there in order to pass their examinations, the grade of certificate determines their standing.

**Representative McADOO.** Do they have the rank of ensign in the English navy?

**Commander HARRINGTON.** Sublieutenant is their lowest rank. That is equivalent to our rank of junior lieutenant. So far as the education of our naval officers went to examination is concerned, we have a torpedo school where the attendance is compulsory.

Representative McADOO. Do you think the system here, of beginning the instruction of the officer with a four-years' academic course, is preferable to the system adopted in the English navy?

Commander HARRINGTON. I have long been of the opinion that our method is the only way to study our profession. I have no confidence in the course at sea. I observed there is very little studying done at sea. The surroundings of ship life are not suited for profound study. Many youngsters go to sea and are unable to do anything with their studies, and when they begin again to study on shore, find themselves less advanced than when they left off.

Senator BUTLER. Our boys generally get away with the others when they come with them abroad, do they not? We have often taken away the honors in France and England.

Commander HARRINGTON. I am very proud to say our officers compare favorably with those of any other country.

Senator BUTLER. I was speaking of the boys at the colleges.

Commander HARRINGTON. At Greenwich, Taylor took away the highest honors last year.

The PRESIDENT. Commander Harrington, the act of Congress to regulate the course of study at the Naval Academy, approved March 4, 1889, section 2, says: "That after the 4th of March, 1889, the minimum age of admission of cadets to the Naval Academy shall be fifteen years, and the maximum age twenty years." Can you state any objections to that law as it stands?

Commander HARRINGTON. I think twenty years too old.

The PRESIDENT. Why?

Commander HARRINGTON. I think twenty years too old to begin life in any profession. The boy enters the day before twenty years of age and graduates the day before he is twenty-six years old to enter the lowest grade in the Navy. But I think a man ought to begin his work sooner than that. When a man graduates here, after four years of effort, he should be given a position of responsibility and have work to do.

The PRESIDENT. How about the minimum age of fifteen?

Commander HARRINGTON. I think very well of that. The Academic Board recommended the ages from fifteen to nineteen as those of admission. There was a strong feeling that the age should not go above nineteen. We should then get an average age of about seventeen years and eight months. Now it is eighteen years and three months at time of admission to the Academy.

Dr. MENDENHALL. Would not eighteen years be still better for the maximum?

Commander HARRINGTON. I have always been of the opinion that fourteen is too young, but think that twenty years is older than desirable. Any young man of seventeen years and three months who can not pass our average examination should not go into the Navy. Our entering examination is not a difficult one, and if he is not at seventeen years and three months, which was the average admission age to the present law, pass an examination which is the examination of an ordinary school boy, he should not be allowed to enter; and I certainly think it is an error to put the age forward to twenty years.

Senator TELLER. Suppose a boy came here, who is far enough advanced in his studies, who has been studying through that intermediate period which marks two extremes of the age of admission; who has, perhaps, been going through very course he will have here. How would that affect the other boys?

Commander HARRINGTON. He would enjoy a very great advantage over the other boys.

Senator TELLER. But in regard to his usefulness to the Government?

Commander HARRINGTON. He would be going through the same course he already gone through. Speaking of the ages for admission, I think fifteen to sixteen years brings together cadets in the same class of too diverse ages.

Senator TELLER. You could remedy that, by making the ages from sixteen to twenty years; but you think twenty years is too old to enter your profession.

Commander HARRINGTON. Yes, I do. I know in other professions men have been successful who began at a later period. I knew a man who started life as a tutor, then studied for the ministry, afterwards becoming a lawyer at thirty-five years of age, succeeding only in the last-named pursuit; and finally concluded his career of good service in the United States Senate. But the life of a naval officer makes it necessary that it should begin early.

Senator TELLER. When do you consider the young man entering the Academy really begins the study of his profession? When does the lawyer's study course begin?

Commander HARRINGTON. When he comes to the bar. So the cadet begins his professional work when he leaves the Academy.

Dr. GARLAND. I suppose a student, twenty years of age, entering the Academy with good attainments for that age would occupy a high position and would go at the fourth class.

Commander HARRINGTON. He would have to pass our examinations in order to enter a higher class.

Dr. GARLAND. Suppose the boy had studied and was proficient in mathematics, up to a certain standard, would you subject him to similar examinations, or would you relieve him from those studies?

Commander HARRINGTON. If he could pass all the examinations of the fourth class year, he could be put ahead into a higher class (the third). If not advanced a class, he would have more time than other cadets to devote to branches of study, in which he had not been schooled.

Senator TELLER. If he was thoroughly up in geometry, would you require him to go through your course?

Commander HARRINGTON. Yes. That would be an exceptional case.

The PRESIDENT. Where you find a cadet who had been educated in France, would you oblige him to take the French course?

Commander HARRINGTON. Yes, sir, but he could take French and German or Spanish.

Dr. MENDENHALL. Does not the different character of the course make it impossible for the boy to take an advanced place in his class merely because of the training he had in outside schools?

Commander HARRINGTON. I doubt very much whether it could be done beyond the third class. Previous good training, doubtless, helps a cadet at first, or until the Academy methods develop the natural traits of all the cadets of a class.

Dr. MENDENHALL. All your drills and exercises and professional work he would not have had.

Senator TELLER. But if he had a thorough knowledge of mathematics, he could devote more time to electricity.

Commander HARRINGTON. He has to go to class and attend his study hours the same as the others. If a professor finds he can advance a man and give him higher problems, work of the same general class, but more difficult, that would be done, and he would be at the top of his class in that one study, and enjoy the additional advantage of being able to put more time to other studies. That is a case that occurs frequently in this school; there is hardly a year passes that we do not have a cadet who has these advantages.

Dr. MENDENHALL. I would like to ask Commander Harrington how many hours per week are required for recitation during the first four months of the year, including such as ship and drill exercises?

Commander HARRINGTON. Nine hours for five days and with an average of four hours on Saturday. That includes study hours, recitation periods, and drill hours.

Dr. MENDENHALL. About fifty hours per week?

Commander HARRINGTON. Fifty-one or fifty-two hours per week.

Senator TELLER. Does that cover the time devoted to study and recitations?

Commander HARRINGTON. Yes, sir; and to drills also. I must qualify that answer, in this respect: Where a department calls upon a cadet to spend two hours, an entire period, upon practical exercises, chemistry, or navigation work, that requires no previous study, then all other departments gain forty minutes. For example: this afternoon the head of the department of navigation will take cadets of the first class for two hours; he gives no lessons to study, but there are forty minutes that go to the other two departments, and in that way the cadet gains a good deal of time for study, over and above the usual time.

Dr. MENDENHALL. I should not regard that as excessive.

Representative MCADOO. When a boy goes to the board, and there is a large section, does he have time to work out a problem, or is he pushed for time?

Commander HARRINGTON. As a rule, he stands there until through. Before the bugle blows, if he is not through, the instructor assists him. They are never hurried and are allowed to take as much time as they please, within the hour.

Representative MCADOO. Do you think that is long enough?

Commander HARRINGTON. The instructors can not hear more than a certain number recite. I think sections rarely exceed 8 or 9, and in the mathematical department, 6 or 7.

Dr. MENDENHALL. Is it customary for instructors to give the young man assistance, if he is failing to get his problem; or does it go until the next day?

Commander HARRINGTON. The instructor usually assists. Sometimes, the next day, he may be tried on a similar problem. The cadet has a different instructor each month.

Dr. MENDENHALL. Then as the section goes to another instructor, does he not have the first instructor again?

Commander HARRINGTON. He may, in being transferred to another section. Usually he passes to another instructor.

Dr. MENDENHALL. What is the object of that change?

Commander HARRINGTON. It is the result of long experience. Some instructors



mark higher than others, and the object is to give each cadet a general average, being marked by all the instructors of the school.

Dr. MENDENHALL. But I should think the object should be to instruct the young man?

Senator BUTLER. It is a check upon favoritism.

Commander HARRINGTON. If there were any disposition to treat a cadet unfairly it would be a check.

General WALKER. It is not a virtue to have a student take his course under different teachers.

Commander HARRINGTON. I never saw any objection on a cadet's part to a change in particular instructors, though there are some who are more popular than others. I think one officer in this school enjoys a very high reputation as a teacher, and like to get with him.

Dr. MENDENHALL. I think that sort of change is risky.

Senator BUTLER. Is every cadet called upon at each lesson?

Commander HARRINGTON. He is liable to be called upon. The idea is to give him a recitation each day. He does not know what branch of the subject he may be called upon to explain; he has to study the whole lesson.

Senator TELLER. If he gets skipped two or three times he loses the opportunity to be marked, does he not?

Commander HARRINGTON. No; when a cadet recites but once per week, that mark only has half weight. If it is a very high mark, it only serves to pull him up a little, but little, and not as much as if the result of two recitations.

Senator TELLER. But if a boy could have made perfect recitations at each lesson he has lost something. Suppose he had been perfect at every recitation?

Commander HARRINGTON. Then his mark would be perfect. Let me explain: making up the marks for the month, that week in which the boy recites but once would have half weight only as compared with the weeks in which he does his work.

Senator TELLER. The point is, if he is a student that is fully prepared to give perfect recitations, the dull scholar may get some advantage from him?

Commander HARRINGTON. Where that happens in one case the instructor seethes the next week offsets it. It may be that a cadet is sick. He misses the mark altogether on that week. We have to have certain rules in giving the recitations a certain weight, and as there has never been any evidence of dissatisfaction of this mark on the part of the cadet, we have looked upon it favorably. We have never heard a cadet complain of it.

Senator TELLER. Do not they complain if they are never called upon?

Senator BUTLER. In the course of the month there is a sort of average for the cadets. They have to pass through a certain number of recitations.

General WALKER. In a small section is a man called every day?

Commander HARRINGTON. Sometimes the Navy Department is not able to supply the full number of instructors needed. If seven instructors are needed and only five supplied the students can not be called upon every day.

Representative MCADOO. In what year of the academic course do the largest number of boys fail?

Commander HARRINGTON. The first year.

Senator TELLER. What number of instructors have you?

Commander HARRINGTON. I have four assistants, who have nothing to do with scholastic duties.

Dr. MENDENHALL. What is your judgment in regard to the effect the marking system has upon the efficiency of the instructors? In other words, is the necessity on which the instructor stands of measuring the recitation a detriment to his success as an instructor?

Commander HARRINGTON. I think it has a very beneficial effect upon the officers who are instructors. At the beginning of his career as instructor at this school, an officer's teaching is usually indifferent; he don't know how to teach. The first year he is learning how to impart his knowledge, and he is not a very valuable man; the next year he has acquired a thorough information on the subject and learns to teach, but there is no doubt that cadets do suffer to a certain extent from being under an officer who has just come into the department.

Dr. MENDENHALL. It is in regard to the system I inquire. The question is, can an instructor be an instructor and teacher when he is at the same time an examiner? Does not the fact that he is examining the pupils interfere with his work as an instructor?

Senator TELLER. His object being to impart knowledge?

Commander HARRINGTON. I think that the criticism is perhaps just, in a modest degree.

Dr. GARLAND. But is it not necessary to be an examiner in part in order to be an instructor? How can I know how to instruct unless I know what the pupils do not

ies are? The Socratic method of teaching is the most perfect, after all. What is the examination in the recitation room? I must know what the difficulties of the student are, though I may not care to give the marks.

Commander HARRINGTON. We must have a system of marking; we must say how these pupils are to be graded; and, while this method is open to criticism, I must say there is a great deal of instruction given outside of the work of examining the pupil. It is common for an instructor to stop all work and gather cadets about him, to explain the difficult points. On the other hand, the marking is essential. We can not grade the pupils without this daily marking.

Dr. MENDENHALL. Is instruction given by lectures?

Commander HARRINGTON. There is considerable lecturing done in the school; but I think experience does not point in favor of it as a means of instruction. When lectures are delivered slowly, and copious notes taken, they are more effective. We not approve of lectures given in an off-hand way, that cadets are unable to follow. I know precisely what is said. I think our system of marking is the most perfect in the world. We borrowed it from the French originally, and we have brought it to perfection here. You will see often a cadet here marking himself, and at the end of the month he will be very close to the instructor in the final mark.

Dr. MENDENHALL. But does this fact justify the system? Other educational institutions, outside of the war schools in this country, have been, for twenty years, drifting away from that system, and the science of pedagogics, if there is a science, and it is generally acknowledged now [to its disfavor]. There is a loud cry against studying and working for merits among students, the belief generally being that it does not work good. Is it not significant that outside educational institutions almost unanimously condemn it?

Commander HARRINGTON. If we could substitute weekly examinations it would be better. I believe with weekly examinations we could grade them better; but to do that you would have to give up one day in five. In every study we already have monthly examinations. The examinations constitute a more severe and a more precise test of acquirement.

Dr. GARLAND. I was examining the rules by which you grade the students. I see you multiply the standing by 3, add the examination as 1, and divide the whole by 4; that is giving more weight to the daily performances than to the examination. How can you avoid the disposition of the student to cram himself from day to day?

Commander HARRINGTON. I presume the efficiency of our course depends upon examinations, and, as Dr. Mendenhall says, "every day's work is an examination." Practically, the daily examination is oral. At the end of the month the examination is written.

Dr. GARLAND. Suppose the student, during the month, from excellence of memory, is able to perform well from day to day, and he is marked high. At the end of the month give him problems which require from him knowledge of principles, like it necessary for him to solve new problems, to which he will prove equal to a degree that he has mastered them. Would not such an examination as that determine the grade of excellence?

Commander HARRINGTON. I think so; but the stress upon the cadet would be more rigorous. One examination might be fatal. The existing method affords fair opportunities to all to avoid failure.

Dr. GARLAND. Is there no other way to determine precisely the merits of the students?

Commander HARRINGTON. Yes, providing the examinations are sufficiently numerous. When we have repeated examinations of that character it is the best test. Each cadet undergoes twenty-five examinations in the school year in the fourth year, and the second class undergoes about forty. These are the written examinations outside of daily recitations, and they are very strong factors in grading the

Dr. MENDENHALL. Would it not be sufficient to base your judgment on these examinations and omit the daily marks?

Commander HARRINGTON. We should drop very many more cadets, but would be purer of the knowledge of the remaining ones.

Dr. GARLAND. You would lose the stimulus they derive from their study.

Commander HARRINGTON. This has been thought over during fifteen or twenty years. Professor Hendrickson can tell you about the results of weekly examinations. I think what we are doing is the best way to get work out of the cadets and to get them to acquire the different branches of study.

Dr. MENDENHALL. There is another objection I have to this daily marking system. Don't you think it interferes with the opportunity of the instructor to impress himself upon the class and to infuse his enthusiasm into them? It seems to me it is possible to have that enthusiasm and sit with the list in hand and mark down 2½, every time a fellow makes a recitation. Is it not true that the touch of the live man is sacrificed by this marking system?



Commander HARRINGTON. Perhaps it is diminished. I should like to have you go into our recitation rooms and see the work as it is really done. The instructors are around the room, catechising the cadets and helping them. We labor under disadvantages of not having regular instructors of long experience. The first year the officers, acting as instructors, are not worth much; the second year they are much better. The third year they are really valuable teachers, and then they have to leave us. That course educates the officers. We are not pedagogues; we are students ourselves, and work with the cadets.

Senator TELLER. Suppose a cadet of the fourth class, along in the second or third month of his first half, shows signs of failure in any of the departments; suppose comes to his recitation in algebra, and is not clear—for example, has a low mark, and again has a low mark, what is done in reference to that cadet of the fourth class by the instructor of the department of mathematics where he shows signs of weakness?

Commander HARRINGTON. I can not tell you exactly what is done; I only know he is the object of solicitude and attention. Generally, I say something to him, encourage him. The head of the department takes an interest. Generally the lower section is given in charge of some officer supposed to be a good teacher; often the head of the department takes it himself. Very frequently they are allowed to have special instructors. Along at the end of the term a cadet comes to us and says: "I am not getting along;" and very often an officer comes in to work with him for an hour or an hour and a half, devoting himself to that study in which the boy is lacking. There are plenty of officers who give up an hour a day to special instruction of a student.

General WALKER. Are the relations between the officers and students such as to make the students confide in them?

Commander HARRINGTON. I think the relations are good.

General WALKER. I don't mean to ask if there is any animosity.

Commander HARRINGTON. In February last three or four cadets were deficient in the second class, and I was interested in their behalf because of their good conduct. I pleaded with the Board, and they voted to extend their time and give them a re-examination. The head of that department began to give them special instruction every evening, for three-quarters of an hour of their study period and part of their recreation time, and, as a result, they passed their examinations and will be continued. That was work he was not required to do as a part of his official duty.

General WALKER. I should like to ask, whether, in his observation of the students in their drills and in their individual amusements about the campus, and wherever he may meet them, if Commander Harrington notices any considerable failing in them. Do they impress him as overstudied or overworked men? Whether towards the close of the term they appeared overworked?

Commander HARRINGTON. I think there are a few such cases every year.

General WALKER. Speaking in a general way?

Commander HARRINGTON. Generally, no. There are a few such cases every year, but I should say it is not a general effect. I lament very much the trouble we have with athletics, and I have to force them against their will. If we had our gymnasium right alongside the living quarters there would be a very different story. I induced the cadets to get up an athletic tournament this year, and on Wednesday afternoon we will give you an exhibition. But I have the utmost difficulty to find the time for the cadets to visit the gymnasium often. It takes fifteen or twenty minutes to go to the gymnasium and back to the quarters. I think there is no question about it that the cadets at this school need more such training as they get at the gymnasium.

General WALKER. Are these exercises supervised by a surgeon or expert?

Commander HARRINGTON. We have an expert who has been here twenty years. He is under the supervision of the commandant of cadets, but I know very little myself about the safety of the training. I have seen a student go in there and the master would say to him "Look out! you will hurt yourself; don't you do that," and the cadet would suppose it all right.

If I had one recommendation above another to make, it would be that the gymnasium be moved over alongside the living quarters; next, to extend the practice cruise and abolish the annual leave. I might say the annual leave is not good for the cadets. The old plan of giving them three months and a half leave at the beginning of the second class year commends itself, to my judgment, for many reasons. With that system of leave the practice cruise would be a month longer annually. It is a matter of regulation, which the Secretary of the Navy can control.

Medical Inspector T. C. WALTON, of the Academy, appeared before the board. He stated that he was in charge of the medical department of the Academy, and also of the department of physiology and hygiene.

Senator BUTLER. How long have you been at the Academy?

**Dr. WALTON.** Six years.

**Senator BUTLER.** Will you be good enough to give the Board your opinion of the effect of the study required here upon the physique of the cadets?

**Dr. WALTON.** So far as I have observed, I think all those who enter here, having good physiques, are benefited by the course. I have seen no injury that I am aware of in that time. There are some few cadets who, after having been entered here, when perhaps the medical board has been doubtful about their fitness, or that the medical board rejected and the Navy Department has waived their defects, who have failed. The strain has been too much for them. During the term of my duty here, perhaps two or three times, I have noticed that the strain has been too much for them, and I have recommended that they either resign or take a vacation, and one or two of them are on leave now. In one case, the boy being on leave now, and who stood number one or two in his class, I ascertained he had been taken from school on at least two occasions before he came here from overwork, and I found that the strain was too much for him, and recommended him to take a leave, and he left in February. I had to watch him very closely at the time, as he was anxious to finish his semi-monthly examinations. He is now at his home, and expects to return here in September or October, and to pass his annual examination. If he can get 2.5, he will be satisfactory, so far as his mental qualification is concerned. I don't know that it will be well to continue that young man; but because his hopes were all bent upon getting in the service, I have not insisted on discontinuing him. I will have to watch him for another year, and if signs of failure come we will have to let him go.

There is another case of a young man who has just passed his examination, and I have recommended that his physical examination be deferred until October. The examinations were too much for him, but still he got through with them satisfactorily. I told his father that if he were my boy I would take him away from the school and not let him stand the strain. He will be granted a sick leave until October, and then his physical examination will be completed. In case the boy is sufficiently strong for the service, and very likely he will fail in the course of another year, his people will then be satisfied that he can not stand the work here. There may be one or two other similar cases. The defect of those who fail has been owing to some cause existing prior to the time they came here.

**General WALKER.** Sometimes caused by the boy's great grandfather?

**Dr. WALTON.** Sometimes you don't have to go back so far as that.

**General WALKER.** You may reasonably expect to find some students constitutionally weak?

**Dr. WALTON.** There are not as many cases of break-down as I expected to find when I came here.

**Senator BUTLER.** It takes a very good constitution to stand the strain?

**Dr. WALTON.** It is often very hard to tell who can stand the work best. The student standing number one of the graduating class last year is an instance of this. He hesitated some time before I passed him. He had a poorly-nourished, very unromising look. But during his course here he was on the sick-list only one day. He mentions that has been made of the extra work done here reminds me that he once told me he never studied overhours, except just prior to the examination; but I supposed he was an exception.

**General WALKER.** Do you think the young man who enters here continues to grow, he would under a less severe regimen?

**Dr. WALTON.** I think so. The cadets are well and regularly fed and exercised. I am satisfied that when they return from sea after their cruise of two years many of them have lost flesh. This may depend on the fact that some of them go in unhealthy states, but as a general rule there is a loss of weight while at sea and an increase while here. The cases in which there is not a good normal growth are very rare.

**General WALKER.** Do you have control of their diet and the hygiene of the Academy?

**Dr. WALTON.** Yes, sir.

**General WALKER.** Will you please state what the sanitary condition of the Academy is?

**Dr. WALTON.** The sanitary condition, generally speaking, is good. We have had no epidemics, with a single exception. We now have several cases of mumps; but when the first case occurs we take precautions and no further damage is done. When a case occurs, I make inquiries to find who have been exposed and caution them at about the time the disease will show on them. We isolate the patients and fumigate their rooms. If it occurs in families, their members are not allowed to mix with ours. We have the diseases common to children here. I don't pretend to control these diseases among children in the families. In my first year, we had sixty cases of measles among the families, but not one among the cadets. Diphtheria is the most severe disease we have had here, but we have lost no cadets from it. One year there were fifty deaths from diphtheria in Annapolis and three among the families in the Academy grounds, but, fortunately, not a cadet was lost. At the outset we did not

recognize that it was diphtheria; we looked upon it as a mild sort of sore throat, upon the first evidence that it was the more dangerous disease we took precaution to control it.

We have a regulation here which requires members of the officers' families to report every case of sickness that occurs, and we take immediate measures to control disease, if it is contagious.

We have all the sewers and urinals flushed once a month, and if there is any contagious disease, more frequently, and a solution of copperas thrown in them. There are a good many old pan closets still in the buildings here, but we are gradually replacing them by better ones, of which we are much in need. The closets of cadets are separated from the main buildings, so there is not much danger to students' health from them. We had a class here during last summer that was allowed unusual privileges; they were quartered in one of the buildings instead of board the *Santee*.

The result was, the youngsters sat out on the ground as late as 9.30 o'clock p. m. and some staid out until 10 o'clock; some got outside the grounds, and, staying some time, swam around to where they could enter without being reported. That was calculated to do their health any good. Then a drain was being dug here for a supply of water, and as there was some trouble about getting pipes the drain was open for two or three weeks. Then they were allowed to go out in town a good deal, and the result was when they left, about the 25th of August, a number complaining, and in a short time ten were sick with fever. One shortly afterwards died from what was thought to be typhoid fever. I had been here a long time, thought I knew the place pretty well, but could not find the cause of the trouble. After thorough investigation we finally came to the conclusion that it was malarial fever. The result was that three or four of the young men having the disease were turned back a class. The others, except the one who died, have managed to keep with their studies. Of the several cases of typhoid fever we have had during service I am satisfied that they can be traced outside, and that they have not been contracted in the place. I have recommended to the Superintendent that the cadets be quartered on board the *Santee* this summer, and that they be not allowed to go ashore at night. I would let them go in the town in the afternoon, but keep them at night. The young man who died used to go ashore at night and not return until 9.30 o'clock. I have told the families here that if they stay out on the grass in the evening they will have fever, and they get it when they stay out. This year I think we will have less trouble about such matters.

General WALKER. Is the drainage of the Academy generally good?

Dr. WALTON. Yes, it is generally good.

General WALKER. Is there any reason to distrust the purity of the water?

Dr. WALTON. The water is the purest in the country. There is a certain amount of vegetable matter in it, but there is no sewage.

General WALKER. Have you a satisfactory hospital?

Dr. WALTON. Yes, sir.

General WALKER. What staff have you?

Dr. WALTON. I have four assistants.

General WALKER. Is there an evening sick-call?

Dr. WALTON. Yes, sir.

General WALKER. I should be glad to have you say what you teach in the course of physiology and hygiene.

Dr. WALTON. The first thing we have in view, is to teach the effect of alcoholic liquors and narcotics on the system. That is what the law requires. We do this by giving them a fair account of how their bodies are formed, how they grow, and the functions of the different organs of the body, such as the skin, the lungs, the liver, and the stomach. In speaking of the skin, we mention the effects of bathing, the necessity for it. We describe the properties of clothing and tell them what is proper for them to wear. In speaking of the lungs, we describe the process of respiration and show what the ordinary impurities of the air are and how to best ventilate rooms and ships. We tell them generally what is necessary for a healthy body, something about the ordinary foods they are liable to eat. In the matter of describing the effect of alcohol, we comply with the law; and in regard to tobacco, I give them what I believe to be a correct idea of its use and abuse.

Then they are taught practices which are of use in general emergency cases, such as to arrest hemorrhages, etc. They are taught how to rescue persons from threatened death, consequent upon drowning.

I don't talk much about narcotics. I don't believe there is any use in describing these boys the effects of opium and hasheesh. I give them a general idea of what narcotics are and what their danger is, to the human system, without going into detail. I tell them the nature of tea, coffee, tobacco, and alcohol. They are given the percentage of alcohol contained in different liquors, and a full account of its effect on the various organs and tissues of the body.

General WALKER. Have you reason to believe that there is much smoking among the cadets?

Dr. WALTON. Very little. I found two years ago between forty and fifty of them with derangement of the heart. I made an investigation as to the cause of it, and concluded that it was owing to the use of tobacco; in a few cases, from a too free use of coffee. We have had the ration of coffee cut down; they are allowed coffee for breakfast only. The punishment for the use of tobacco has been increased, and now seven, or even ten, demerits are given them. There is very little use of tobacco. When they were stopped smoking, they started chewing, that being harder to detect. There was a time when the First Class was allowed to smoke, but there is very little use of tobacco now.

General WALKER. As you observe the students on the grounds and moving about, do they seem to be listless or tired out? Do you notice any difference in their condition during the first and last of the term?

Dr. WALTON. They are not overworked. I see a great deal of them. They are very wearied at the end of the term, very often. They are apt to trifle away their day at the first of the term and then settle down to hard work along towards the end.

General WALKER. What is your opinion of the value of the annual leave of a month in comparison with a leave of three months near the end of the course?

Dr. WALTON. I think the annual leave is a mistake. Some contract diseases while some whose homes are far distant do not go there at all. Those who live in northern States are apt to get malarial fever and bring it back with them. I think the leave is of much benefit to them. I would have them all take the summer cruise and have it extend until October, and then let them commence with their studies. I think they ought to have three months' leave at the end of their first year.

Senator BUTLER. That is the rule at West Point.

Dr. WALTON. Then the last year they don't have so many new studies to occupy them. The work then is not so difficult.

Mr. MENDENHALL. Do I understand you to say the last year is the easiest?

Dr. WALTON. The students don't then have so much mental work; it is more practical.

Mr. MENDENHALL. Which is the most difficult year for the cadet?

Dr. WALTON. I suppose the third year is. The majority of the failures occur during the first half of the first year, but that is because they are not prepared and can't settle down to the discipline here. It is found out in that six months who are wanted for the service and those who are not are weeded out.

Mr. HERBERT. Do you have many cases of trouble with the eye-sight?

Dr. WALTON. Not many.

Mr. HERBERT. Is there any special cause to which the trouble is attributed?

Dr. WALTON. There is often a change in the eyes of young people at the age of the cadets while they are here. I don't think we have a greater proportion of these cases than they do outside. No matter what the boy does there will be that change. It is before an examination some of the boys will stand out in the halls and study by a poor light thus hurting their eyes and catching cold.

General WALKER. They stand in the halls because the lights in their rooms are poor?

Dr. WALTON. Yes, sir; the regulations provide that the lights shall be put out at a certain time. The light they have in their rooms is pretty good for study. They use Argand burners, which are placed over the center of the table in each room and the cadets wear shades over their eyes. The only objection to that burner is that it overheats and it tends to vitiate the air of the room, but it is questionable whether the electric light would be an improvement. I am not satisfied that the electric light is suitable to study by.

Mr. MENDENHALL. What is the possible objection to it?

Dr. WALTON. I don't know; I have not yet seen enough in its favor; its continuance is said to fatigue the eyes; I believe it is worth while trying; I would advise trying it in a few of the quarters before adopting it generally.

Mr. MENDENHALL. It is steady and does not vitiate the atmosphere?

Dr. WALTON. We ought first to have some report of its fitness from our ships. The thing that I have seen about it is that a medical man in London published an account of a disease of the eyes due to the electric light. He said he had thirty cases of it. I have heard others say that after using it awhile it becomes very injurious to the eyes.

Mr. MENDENHALL. That is the arc light. The incandescent is different?

Dr. WALTON. I would not object to the light being tried here, but it would have modified somewhat. We are not suffering from the light we have.

Mr. HERBERT. Do you think the Argand burner and gas is better than the student to study by?

Dr. MENDENHALL. I see some men wearing spectacles; are they admitted with that defect?

Dr. WALTON. No; the standard required is that they must be able to use their special senses without artificial aid. But in this case the student's vision has become impaired since he came here, and we are letting him go on for two years. He will make his cruise and then he will resign, and that may have something to do with my leniency towards him. I thought he would be able to make his cruise, but whoever examines him will see whether he is able to remain or not. I told him that I would reject him.

General WALKER. Do you know of any great trouble with the eyesight when drawing is practiced to any great extent?

Dr. WALTON. I think that affects them. We test them before they enter, and the cases that fail are the cases that the medical board is in doubt about.

Senator BUTLER. Don't you have some cases of color blindness?

Dr. WALTON. Yes; but the rules for detecting it are so explicit that most of the cases are weeded out before they come here. We had one case this year. I don't know how he escaped the medical man. I try to make the instructions to cover the detection of this defect so plain that there may be very few cases to reject.

Senator BUTLER. We understand you to say that generally the course of study and discipline here is not too great a strain upon the average student?

Dr. WALTON. I am satisfied that it is not.

General WALKER. It seems to me that the boys have a very elastic step.

Dr. WALTON. Our sick-list does not amount to much. One-half the time the youngsters who complain want to get out of their recitation for the day. Headache was a racket they generally worked on us. I said to the doctor who was holding the sick call: "This is a perfect farce; we must stop it." Finally we had an assistant here who carried out my instructions to the letter. During the three months before he arrived I had one hundred and seventy-six admissions for headache, and during the three months he was here I had eight. I don't doubt but there may have been some fellows who had headache who were not excused.

Dr. MENDENHALL. What was his method?

Dr. WALTON. He would talk to them. He would say: "So you can not study to-day," and the boy might answer, "I am not prepared with my recitation." The doctor would take their temperature to satisfy himself they had no fever, and then he would say: "We are not putting on the sick-list to-day for headache." After a time these boys didn't come near us?

General WALKER. How about the cases of men who are subject to habitual headaches.

Dr. WALTON. There are some such cases. In the case of first classmen we take their word. But the complaint is usually by the fellows at the foot of the class, and in the past the privilege of getting excused was abused. But I am more lenient with them now. It often saves the fellow demerits to get excused, and sometimes I save them. Sometimes they would get a zero or a very low mark, and if they could get on the sick-list they would be satisfactory for a week, and that was the reason many of them worked it. So you see the health statistics of this place must be taken with some allowance.

Senator BUTLER. I see the boys learn how to play "old soldier" as well as older fellows.

General WALKER. I don't see why you can not call it "old sailor."

Ensign H. G. DRESEL, assistant in the department of mathematics, appeared before the board.

General WOODFORD. How long have you been an instructor in the math department?

Ensign DRESEL. One academic year. I have been attached to the Academy August, and have been teaching since October. I am instructor to the third and fourth classes.

General WOODFORD. Do any instructors in the mathematical department (more than two classes)?

Ensign DRESEL. Not in our department. I don't know how they do in the department of applied mathematics, as I have nothing to do with it.

General WOODFORD. Please explain to us how the fourth class is arranged. the boys come in, what is the first thing you do with them?

Ensign DRESEL. They are arranged alphabetically first.

General WOODFORD. How many are assigned to each section?

Ensign DRESEL. About nine or ten to each section.

General WOODFORD. These sections are known or numbered how?

Ensign DRESEL. From one to nine, or ten, according to the number of sections.

General WOODFORD. Does Professor Hendrickson have anything to do with the fourth class in its instruction?

Ensign DRESEL. He takes the first section.

1 WOODFORD. Does he instruct the other sections?

DRESEL. Not during my time as instructor.

1 WOODFORD. How soon after the academic year begins are the sections formed?

DRESEL. After the first month, and then the sections are formed according to the ranking of the students each month.

1 WOODFORD. You say the alphabetical sections are broken up after the first month?

DRESEL. Yes, sir; and ratings made according to the examinations and marks.

1 WOODFORD. Who are put into the first section?

1 DRESEL. The highest nine or ten.

1 WOODFORD. So that if there were nine sections the ninth would contain the lowest in their marks?

1 DRESEL. Yes, sir.

1 WOODFORD. Yes; but the first section would contain the highest students. During the last year who taught the highest section?

1 DRESEL. Professor Hendrickson.

1 WOODFORD. Does the second section have the same instructor and the fourth, fifth, sixth, seventh, eighth, and ninth?

1 DRESEL. No, sir.

1 WOODFORD. Have the instructors, in all the sections beside, the first, been changed each month of the academic year?

1 DRESEL. Yes, sir.

1 WOODFORD. Have they been frequently changed?

1 DRESEL. I think they have been changed every month.

1 WOODFORD. But the first has not been changed at all?

1 DRESEL. No, sir.

1 WOODFORD. Then the first section, consisting of the nine or ten boys highest in marks, have had the personal instruction of the head of the mathematical department throughout the year?

1 DRESEL. Not necessarily the same nine or ten boys highest in marks; those of the first the first month need not necessarily be so after that.

1 WOODFORD. Those who are highest each month are the ones that constitute the first section for the next month; and the first section has had the personal instruction of Professor Hendrickson throughout the year; so that the nine or ten highest each month get the personal instruction of the head of the mathematical department?

1 DRESEL. Yes, sir.

1 WOODFORD. Is that so regarding the third class?

1 DRESEL. I think Professor Hendrickson has had them right along.

1 WOODFORD. You have had the first section in the third class occasionally give recitation?

1 DRESEL. Yes, sir.

1 SENATOR HERBERT. Do you know the reasons that prompt this course on the part of Professor Hendrickson?

1 DRESEL. Formerly he took the lower sections, and had once been accused of taking a lower section of trying to bilge him by marking too low, though that, as shown, was false. Consequently he would not expose himself to a repetition of this charge. Investigations were held regarding these charges, and cadets were compelled to resign, the charges having been disproved. He takes pains to help out his assistants in their work.

1 SENATOR HERBERT. And this is the reason for his course?

1 DRESEL. Yes, sir; I think so.

1 SENATOR McADOO. Are you cognizant of complaints among the boys because of the change of instructors every month?

1 DRESEL. I have never heard them. I think it is a very good system. Some boys mark higher than others, and their ideas of what is perfect is a little different. So, if I, for instance, mark low and had the same section continually, they would be behind others.

1 SENATOR McADOO. On the other hand, a boy gets accustomed to the methods of a teacher and finds himself in agreeable relations with him, and next month a new teacher is given him who has new methods, and who himself might be repulsive to him.

1 SENATOR HERBERT. How long since Professor Hendrickson adopted the course of having the first section exclusively under his charge?

1 DRESEL. I do not know.

1 SENATOR ROOT. Is there any peculiar work attached to the studies of the first section of the entire year which would lead Professor Hendrickson to hold on to it?

Ensign DRESEL. No, sir; I think not. He always lays down, in writing, what we are to teach, and we can teach our sections exactly what he teaches his section. He has a lesson-book for each week, in which he writes out the outline of his work, and we copy it and give our section the same lesson that his gets.

Professor ROOT. Has he any other way, save by the marks, of reaching the members of the lower sections?

Ensign DRESEL. No, sir; he leaves the marking of the sections entirely in our hands. We correct the papers and make out the final average, so that he has no charge of it.

Professor ROOT. Does not Professor Hendrickson, at any time, during the year, reach personally cadets in the lower sections?

Ensign DRESEL. He comes in the recitation rooms sometimes, but in no other way that I know of.

Professor ROOT. How largely does the position of the first section change from month to month, during the year?

Ensign DRESEL. About 25 or 30 per cent.

Professor ROOT. Then of the ten men who were assigned to that section at the close of the first month, there would be seven or eight in that section through the entire year?

Ensign DRESEL. I don't know. The best way to determine that would be by referring to the records. I can not trust to my memory for that information.

Representative McADOO. Don't the boys get his standing about the middle of the year? After you divide the ninety boys into nine sections, at what part of the year does the standing of the boys become uniform and steady?

Ensign DRESEL. At about the end of the first term; because we change the studies about the middle of the year. In the third class, we have trigonometry during the first term, and conic sections during the second. A student might do well throughout the first term and badly after that. So you can not tell until the end of the year, as regards the exact class standing.

Professor ROOT. I notice in the examination papers that no member of first section is graded lower than three, and no member of the fifth section higher than 2.51. What I want to get at is, how Professor Hendrickson influences the men of the fifth section, manifestly the weak section; or himself comes to bear upon them, to encourage them with their studies?

Ensign DRESEL. Through the instructors. The bright boys would naturally have higher marks. In again referring to the change of positions in classes, by Ensign Dresel said: "I knew one student who started in the first section and went down several sections. Some are constantly changing, going up and down all the time. Some show facilities in one branch and are lacking in others, so that accordingly are shifting in position."

Representative McADOO. You think a majority of the first ten, on entrance to the Academy, stay in the first section?

Ensign DRESEL. About a majority stay in the first section; that is, in the first month or third month.

Prof. N. M. TERRY, head of the department of physics and chemistry, Naval Academy, Annapolis, Md., appeared before the Board.

Senator BUTLER. Are you a graduate of this institution?

Professor TERRY. No, sir; I am a graduate of Amherst College and the University of Göttingen, Germany.

Senator BUTLER. How long have you been here?

Professor TERRY. Since 1872.

Senator BUTLER. Please state what text-books are used in your department.

Professor TERRY. In the second term of the third class, we commence Daniel's Principles of Physics; Practical Physics, by Stewart and Gee; Remsen's Chemical and lecture notes. In the first term of the second class, we continue Daniel's Principles of Physics; Ganot's Sound and Light; Stewart's Treatise on Heat; Practical Physics, by Stewart and Gee; Kohlrausch's Physical Measurements; lecture notes. In the second term of the second class, the text-books are the same as the first, with the addition of Thompson's Electricity and Magnetism; Ayrton's Practical Electricity; Day's Exercises in Electrical Measurements; lecture notes. In the first term of the first class, the text-books are the same as the second class; lecture notes.

Senator BUTLER. Do you find the cadets, up to the time they come to you, prepared for entrance in your department?

Professor TERRY. I arrange my studies according to their preparation. I give them, early in the course, a bird's-eye view of the whole field of study in the department, that they may understand the co-relation of the branches; and afterwards study more thoroughly, with the special text-books just named.

Dr. MENDENHALL. How do you give that "bird's-eye view;" by recitations?

Professor TERRY. By daily recitations, by occasional lectures, and practical work. I detail them for practical work after they have prepared the lesson for the day.

Dr. MENDENHALL. Have they had any previous study in physics?

Professor TERRY. Nothing is required. Some have graduated from high schools, where they have had an elementary course in physics and chemistry.

Dr. MENDENHALL. Of what does your laboratory consist?

Professor TERRY. We have good buildings, with instruments for illustrating our lessons and making physical measurements.

Dr. MENDENHALL. Are the experiments qualitative or quantitative?

Professor TERRY. Many are merely qualitative. What I seek to arrive at is exact demonstration.

Dr. MENDENHALL. Do you yourself make the experimental illustrations from your lecture table?

Professor TERRY. I do to a considerable extent, though I try to make the cadets perform the experiments as far as possible.

Dr. MENDENHALL. How many hours a week, during the first term, do you devote to the work in your department?

Professor TERRY. We give five periods to it; that is, five hours a week. Then there are recitations only, but part of the term the sections go, upon alternate days, to the chemical laboratory for practical exercises, instead of their recitation, and when no time is required for preparation, the cadets are allowed to remain the whole period (two hours) in the laboratory.

Dr. MENDENHALL. How many students are there in your class?

Professor TERRY. Sixty-two in the third class, 36 in the second, and 35 in the first class.

Dr. MENDENHALL. How many assistants have you?

Professor TERRY. Six. In the practical work the instructors are generally employed two hours a day, and in recitation, one or two hours. In addition to this time, which is devoted to the instruction of the cadets, they pursue for themselves, what is, in reality, a post graduate course in physics, for which this laboratory affords excellent facilities.

Dr. MENDENHALL. Does this course continue through the second class; that is, does it cover two years?

Professor TERRY. Yes. The course in physics and chemistry covers two years; one term of the third class, two of the second, and one of the first.

Dr. MENDENHALL. What proportion of the time is given to physics and what to chemistry?

Professor TERRY. Three-fourths to physics and one-fourth to chemistry.

Dr. MENDENHALL. Of the time devoted to physics, what proportion is devoted to electricity?

Professor TERRY. I should say about one-third of the whole time. I could get you exactly the amount.

Dr. MENDENHALL. During any part of this course, do you have a longer period for laboratory exercises than one hour?

Professor TERRY. Yes, we extend it over two hours sometimes.

Dr. MENDENHALL. Would it not be better to have a longer period of three hours?

Professor TERRY. I should like to have a longer time that I might give many experiments for which we do not have time now; and in order to get better results, which are sometimes not satisfactory, as I have to take one part of an experiment one day and finish it the next.

Dr. MENDENHALL. Are the studies marked for the hour which is devoted to this practical work, according to the system which has been explained to us as in use?

Professor TERRY. I have tried various experiments in marking them for that work, and now have a plan which seems to work very well. I have little cards and at the top is marked the name of the cadet whose marks it contains. A portion of it is devoted to marks for experimental work, which is divided into three columns; in one of which I give a mark for zeal, in another ingenuity, and in the third for results. These are averaged and the result is used as if it were a daily recitation mark.

Dr. MENDENHALL. Is the examination of the student so complete every day that you can give him a mark on the result?

Professor TERRY. Sometimes I don't mark them on zeal and ingenuity, when I have not basis enough for a mark. But the general plan is to give marks for the three.

Dr. MENDENHALL. What is the nature of the lectures you give them occasionally?

Professor TERRY. The lectures are to illustrate the text-book and recitation-room; and to give supplementary information on subjects of special importance to naval cadets.

Dr. MENDENHALL. The text-books are not thoroughly studied I suppose, but are used for reference.

Professor TERRY. I frequently assign a topic for a recitation and require the cadets to



get their information from every available source, but for the most part definite lessons are assigned and the cadets are strictly marked upon their recitations and written examinations.

Dr. MENDENHALL. Do your students undertake original investigation and experiment?

Professor TERRY. They have done so, but the opportunity is not very great, because they can not work continuously. Some of them have done pretty fair work. I should like to show you a paper on the result of an experiment made by a cadet who is now a constructor and was then a cadet-engineer.

Dr. MENDENHALL. Did the cadet-engineers take a more thorough course than the cadets do now?

Professor TERRY. No, sir. Their attention was directed especially to heat, analytical chemistry, and mineralogy whenever they were allowed extra time in this department.

Dr. MENDENHALL. Do you give instructions in thermo-dynamics?

Professor TERRY. We take them through a course that touches on that slightly. This year the course on thermo-dynamics is more thorough, but it is not possible to take an extended course in thermo-dynamics in the time allowed.

Dr. MENDENHALL. Have you a reasonably fair equipment for giving instructions in physics and electricity?

Professor TERRY. We have a good laboratory, but I would like a large amount of money to expend on it.

Dr. MENDENHALL. Is there anything which you think you especially need? It is one of the functions of our board to consider these things.

Professor TERRY. I would like to equip a dynamo-room, so that I would have a specimen of the dynamos used on the new cruisers. I now have an old-fashioned Edison dynamo and a Brush dynamo. The students learn to start the engine and use the dynamo. I would like a low-speed dynamo connected with a high-speed engine.

Dr. MENDENHALL. Have you a good equipment in the way of light appliances, lamps, and measurements, etc.?

Professor TERRY. I have a small Brush machine and run two arc lights with it, and a fifty-light Edison dynamo. The students sometimes make determinations of the efficiency of the plant; but the dynamo plant is very limited, and it would be greatly to the advantage of the first class if they could have a complete outfit, so that they could become familiar with the best dynamos.

Dr. MENDENHALL. Have you any batteries?

Professor TERRY. We have ten of the Accumulator Company's cells, and twenty-five of Julien, and a good supply of good Leclanche and copper sulphate batteries; also one hundred and fifty chloride of silver cells for testing the insulation of cables.

General WALKER. Do you think an advantage would be given the work of your department if the cadets were early in the course put into the workshops for practical mechanical work and continue there through the entire course?

Professor TERRY. I would like to have them do it. They are awkward with their fingers, and if they had manual training it would make them more expert in the work they do with me.

General WALKER. It would train their judgment.

Professor TERRY. I don't think there is time for it now. We are very much limited in our course here in the matter of time.

Dr. MENDENHALL. Is your course in electricity so complete that you would feel safe in allowing one of your graduates undertake and supervise the establishment of an electrical plant on board a ship?

Professor TERRY. I would not.

Dr. MENDENHALL. What further is necessary; experience?

Professor TERRY. The instruction I would give would be experience. I think their knowledge of the theory is sufficient. The dynamos I have mentioned as needed in our work for practice would help fit them for that sort of work. We have sent out two or three men from my department who are fully prepared to go on a ship and put in a complete electrical system. They graduated as instructors. Ensign H. S. Knapp, Ensign R. C. Smith, and Ensign Morgan are examples.

Senator BUTLER. Do you think it would be advisable to have a post-graduate course here?

Professor TERRY. There are so many things connected with that, that I hardly know how to answer the question. I think a post-graduate course could be arranged so that it would be most useful.

Dr. MENDENHALL. What would be your judgment regarding the plan of allowing the young men a choice between staying here and taking the course in applied electricity, and going to sea for two years? What would be the effect of that?

Professor TERRY. From what the naval officers tell me, I think it would be better to go to sea for awhile, though they would not come back as well equipped to com-

their course. But from testimony of naval officers I must say I think it would be for them to go to sea.

or BUTLER. Do you think the course is too severe for the average boy?

ssor TERRY. If the boy is to get into the Navy I think the best material is required and I would rather raise the standard than lower it.

or BUTLER. You do not think the course too severe?

ssor TERRY. No, sir.

or BUTLER. And the strain is not too severe mentally or physically?

ssor TERRY. No, sir. I think the boys are sprightly and in good working con-

or BUTLER. Do you think good results are had by the course as it is given here I do not speak of the men who are preparing for scientific pursuits, but of those who expect to be naval officers.

ssor TERRY. The importance of a scientific training for naval officers is so great that I think the best possible course should be given in chemistry and in physics, especially in electricity. Naval officers are frequently ordered to duties which can be successfully discharged by men ignorant of these subjects.

or BUTLER. You do not think that their pursuit of scientific studies interferes with their qualifications for commanding?

ssor TERRY. I think it benefits them. I think it serves to select the most intelligent men.

or BUTLER. But does it interfere with their qualifications for the general duties of a naval officer though they may be highly intellectual?

ssor TERRY. I think not.

W. W. HENDRICKSON, U. S. Navy, head of the department of mathematics, appeared before the board.

PRESIDENT. How long have you been a professor at the Academy?

ssor HENDRICKSON. Since 1873. I was graduated in 1863 and became an instructor in 1870. In 1873 I resigned my commission as lieutenant-commander in the navy and took the professorship which I now hold.

or BUTLER. I would like you to state how the present course of study pursued at the Academy compares with that of 1863, when you graduated, and also how you came here as an instructor?

ssor HENDRICKSON. My entrance here was during the war, when the course was changed very materially, to enable cadets to get through. In 1870, when I came to the Academy as an instructor, I think it had not recovered from the effect of the changes in the endeavor to get the men through quickly. When I came here the class began with arithmetic and finished with that study and algebra during the first year, and the second year took geometry. They had a full course in descriptive geometry and shorter training in analytical geometry, but no differential calculus until I came here in 1870. The wider scope taken in teaching these studies since that course made a great change. The study of physics has been very much added. It amounted to almost nothing in my time. Then there was no department of steam-engineering until just before I came here in 1870.

or BUTLER. Were the mechanical studies taught in your day very thoroughly?

ssor HENDRICKSON. We used Symth's text-book, which was quite an elementary book.

or BUTLER. Do you think that the amplification of the course of studies you refer to is not too great for a boy to master at present?

ssor HENDRICKSON. I think it is not. I think the results show that. I think the boys are found deficient is not greater than in former days. The boys come to us prepared than they used to. In my time they did not give a great deal of attention to mathematics. I did not spend half an hour on my studies. Our mathematics only included elementary arithmetic and algebra, and I had been through that when I came here.

or BUTLER. What do you mean by elementary algebra?

ssor HENDRICKSON. We used an elementary book. It was Davies, I think.

or BUTLER. I should like to ask if in your instruction of mathematics it is necessary to explain in advance?

ssor HENDRICKSON. I have found that it is difficult to make a student understand a subject by an explanation before he has looked it over. I should like to speak of the question of the amount of instruction given at the Academy, because I know something about it. I have been to West Point, the Boston School of Artillery, Troy, and Hoboken as a visitor, and seen classes instructed at those places and I am sure that at no one of those places can anything like as much instruction be given as there is here. Their instructors have classes of thirty or forty men each with, and they do not have a longer period for instruction than we. At

West Point the time for instruction is an hour and a half, and they confine selves very largely to text-books in catechizing the class and marking the res has always been my aim to teach, and where I could help a student I have done so.

Senator TELLER. I have heard the same complaint regarding the lack of tion at West Point.

Professor HENDRICKSON. They do teach there, but they pay more attention marking than we.

The PRESIDENT. Is it your practice to assist the student in every possible w

Professor HENDRICKSON. Yes; even to the extent of doing his work for him times, which may become necessary.

Dr. MENDENHALL. What are the text-books you use in your department?

Professor HENDRICKSON. In the fourth class, Todhunter's Higher Algebra Chauvenet's Geometry and Trigonometry, and in the latter study we have Tod as an additional book, trigonometry being a third-class study. Other text-bo Church's Descriptive Geometry, C. Smith's Conic Sections, Aldis's Solid Geome

Senator BUTLER. Do you require the cadets to study all these books?

Professor HENDRICKSON. A lesson may be given in one or the other. Chau work on trigonometry is very deficient in examples, and my idea in teaching u matics is to give the boys plenty of work in the way of solving problems.

General WALKER. Do you think the number of students thrown out from ti time during the course is, unconsciously on the part of the Academic Board ceased by the known fact that but a small number can be provided for in the?

Professor HENDRICKSON. I was disposed to think that the law when first pass that effect, and I now think it was so for a time, but I doubt that it is a fact It seems to me that the trouble to get on here can not be charged to the lack of tunity to get in the service.

General WALKER. I mean on the part of the teachers; whether the fact that is no chance for the student to enter the Navy does, perhaps unconsciously, the student's chance on the part of the teacher.

Professor HENDRICKSON. It has had an influence in this way. Previously, v student failed to get in, he was allowed to go over the course another year. this law was passed and the competition became so important, it was thought t to give a man two years when others only had one. So the board did not allow to be taken back for a second year's trial, except in the case of illness, or some equally good reason.

General WALKER. In the case a whole class averages very much higher in ou than in another, do you think you would be likely to graduate a larger percent them?

Professor HENDRICKSON. It would be guess-work for me to answer that. M is, that the average of graduates runs about the same throughout the year. On being better than another would graduate more men, but in point of fact, the of graduates average about the same.

Senator BUTLER. Do you think there has been any improvement in the chara the graduates from the Naval Academy under what may be called the new r since the time you entered? Do they make better officers?

Professor HENDRICKSON. I know that when I graduated they said we were not a cent. That is just what they say about them now. I think the men who are uated now are better in every way. Their conduct is very much better if we tak account the reports of them while on shipboard. We have forty young men com to the Academy for examination after their two years' cruise every year, and w no disturbance of any kind.

General WALKER. Is there an improvement in character as well as in traini

Professor HENDRICKSON. The number of men who smoke and drink is m than it used to be. That is due to the restrictions of the course here, I think.

Senator BUTLER. I referred to the difference in their qualification for nava cers. Do you think they are of a better class than turned out fifteen years

Professor HENDRICKSON. The school has greatly improved, the discipline — as is everything about it. I don't think we have taken any backward step, think this is shown in the character of the men we turn out.

Senator TELLER. The standard of the curriculum is higher, is it not?

Professor HENDRICKSON. Yes.

General WALKER. You get better men, better prepared?

Professor HENDRICKSON. I think so. When I came here I was examined The examinations were carried on from ten to thirty days in all. Now ev examined at the same time. We get the best, I think, and don't let any ge. who ought not to pass.

Representative HERBERT. Have you mapped out the course to be pursued by students who are to be engineers?

Professor HENDRICKSON. In a general way, yes; but it is not entirely

Representative HERBERT. What facilities for teaching the additional course in engineering have you?

Professor HENDRICKSON. No provision has been made. I don't know whether we will need any additional facilities. The instructors in the department of steam engineering will be the instructors in the new course.

Representative HERBERT. Do you expect the instructors to do this additional teaching without any preparation?

Professor HENDRICKSON. I should require a great deal, as I am not an expert in the line of studies that will be pursued in the new course. I think the Chief Engineer would have a great deal to say about how that department would be organized. Everything they have now is old fashioned. The act of Congress is a little curious in the rule it makes for the division of the class. It provides that the class shall be divided in proportion to the number of vacancies of the preceding year in the line and Engineer Corps, but provides that there shall be at least two engineers. Supposing there are no vacancies in the Engineer Corps or in the line, the question would be how could any division be made?

Representative HERBERT. That bill was passed in the shape it was presented by Captain Sampson.

Professor HENDRICKSON. I think it would be better to make a definite division of the class every year. It is not clear to me the utility of having the division depend on the vacancies of the last year, when the appointment of the new officers would not take effect for three years to come.

Representative HERBERT. That provision was probably prompted by the fact that the number of engineers have not yet been reduced to the limit provided in the bill of 1882, and it was not desirable to have any more pursue that course than was needed.

The PRESIDENT. In your opinion, how does the course for the education of cadet engineers provided for in this bill compare with that pursued in the Academy in the past?

Professor HENDRICKSON. I think the system of appointing cadet engineers gave good men, better than we are likely to get under any other system of appointment.

Representative HERBERT. Do the cadets get as much scientific education under the old law as they will now?

Professor HENDRICKSON. I think they get more than of old. Under the old system the men began their training after having entered the Academy, whereas now they will be better prepared for the special course they are to take.

Dr. MENDENHALL. The engineer was pretty near a third-class man when he came here, was he not?

Professor HENDRICKSON. I could give them one book of geometry as a lesson, cause they were coached up perfectly when they came here and had the time they would ordinarily have to give to plane geometry to devote to descriptive geometry, which is a subject very necessary to the engineer. They could accomplish all required of them and have time to spare, and that was partly the reason why the system was broken up. They were becoming the best students of the school.

Senator TELLER. When was that system broken up?

Professor HENDRICKSON. In 1882. Of the class of '81 there were 72 cadet midshipmen and 24 engineers, and under the act of Congress of '82 only 20 got into the service, and the balance were allowed to go. The men who came here as cadet engineers are not the kind to drop out; they were able men.

Dr. MENDENHALL. What would be your judgment regarding the advisability of making the division of the course a year earlier? Would it not make better men if a division of the course would take place at the end of the second year instead of making it at the end of the third year?

Professor HENDRICKSON. We discussed this matter in the Academic Board very thoroughly. We concluded that it was best to make the division at the end of the third year rather than at the end of the second year. The older the men the more they can know about them, and consequently the more judiciously can the division be made.

Senator TELLER. Will the engineers go to sea at the end of their four years' course like the other cadets?

Professor HENDRICKSON. I do not know. I should think they ought not to do so.

Senator TELLER. Would it be advisable to keep them here?

Professor HENDRICKSON. That matter will be in the hands of the Navy Department.

Senator TELLER. Do you think the Secretary might control that?

Professor HENDRICKSON. I think he will probably do whatever the Academic Board recommends in the matter.

Senator TELLER. They will not have a very thorough training as engineers if they come from the Academy at the end of four years, will they?

Professor HENDRICKSON. I think it stands to reason that their profession can be thoroughly learned in one year.

Senator TELLER. The cadet has no special training except in that one year. That he will not be a very skillful engineer.

Dr. MENDENHALL. What has been done in the way of recruiting the Engineer Corps from the passage of the act of 1882 up to the present time?

The PRESIDENT. There have been no vacancies.

Senator BUTLER. What do you think of the advisability of having the two year course at sea, after the four years' course here?

Professor HENDRICKSON. I think on the whole it would be best not to send men to sea for a two years' course. I think it is a pretty long pull for the young man.

Senator BUTLER. Is it better to give him two years' course at sea at the beginning of his course or at the end of it?

Professor HENDRICKSON. At the end, if he is to have the course at all, by all means I think to send the youngster two years to sea at the start would have a very bad effect. I don't think there is any place for a youngster under sixteen years old on board a man-of-war. They should know a little more when they go there.

Senator TELLER. What is the English method of training their officers?

Professor HENDRICKSON. They send them to a school-ship for two years before beginning their course. Their system is nothing like ours. They go to the ship, very young—when they are but twelve or thirteen years old, I think.

Senator BUTLER. What is your opinion about the provision of the act of Congress extending the age of entrance to the Academy?

Professor HENDRICKSON. I was satisfied with the law as it stood previously, when the age was from fourteen to eighteen, though there are occasionally cases of young men who come here, fourteen years of age, who are obviously too young to go through the course, but a great many go through at that age and do well. I think the upper limit, as now established, is too great. It seems to me that the age at which we send a young man out into the Navy is too great.

Senator TELLER. Suppose he were given his commission at the end of his four years' course?

Professor HENDRICKSON. I think that would be a good thing to do. I think twenty years is too old for the upper limit as the course is now given.

Senator TELLER. You think the raise from fourteen to fifteen years is all right. You would have the limit for entrance from fifteen to nineteen?

Professor HENDRICKSON. Yes, sir; I think the limit of age should give the young man as much chance as possible, as there is but one chance for appointment here. At West Point a young man always has more than one chance.

Representative HERBERT. I understand that there has been a gradual increase in the ages of cadets admitted here and that it is now approximating to the upper limit. Does not this result from the habit of Congressmen, of having competitive examinations for the appointment which they give, in which the older men are apt to carry off the prize?

Professor HENDRICKSON. I don't think this is the reason. I could not give any statistics, but my impression is that quite as often as not the young men carry off the prizes in those competitive examinations.

General WALKER. Assuming that there is a certain class of forty men, between the ages of fifteen and sixteen and another between seventeen and eighteen, is it your opinion that a larger proportion of the men of the younger age will graduate than those of the higher limit of age?

Professor HENDRICKSON. I don't think there will be a great deal of difference, but I suspect that it will be in favor of the younger men. These statistics have been made up from time to time and may be found in the Superintendent's office. Of course any statistics of that kind will change from year to year. Some one was speaking of the fact that there are no New England men in the upper classes this year. This so happens, but in the long run I think all sections will average up about the same.

The PRESIDENT. You don't think the locality from which the boy comes has to do with his standing in the Academy?

Professor HENDRICKSON. I can not say I would place one State over that respect.

Professor ROOT. I should like to have Professor Hendrickson explain the under which he makes up his general examinations.

Professor HENDRICKSON. I suppose no two professors teach a subject just as we all have our peculiarities. My general idea in making up an examination is that this comes from long experience, is to arrange a paper so that while to the whole of the work requires the utmost capacity of the best men, yet at the time the work is not too much for what I regard as a standard for the lowest. The highest man I suppose to be able to get a perfect mark on the paper, to arrange the papers so that from my experience the lowest man will be all...

nt five-eighths of it. Generally these young men are well satisfied if they get a t is 50 per cent. I don't know that I can explain my system any better than

Dr. MENDENHALL. How much time is allowed for the annual examination?

Professor HENDRICKSON. Two hours and twenty minutes on each part. I suppose most of us mark up five or six questions to cover the two hours. In the present with class of sixty men but four were below the required limit in mathematics, hough any one not acquainted with the system of examination would think it too

That is a remarkable record.

General WALKER. Does not the system of examinations at the Academy give the students a certain choice as to the questions they will answer or the work they will do?

Professor HENDRICKSON. That is quite frequently done. There are various ways of arriving at the same end. In mathematics we generally give six questions and require five to be answered. The sixth question is known to be pretty difficult, and those who can tackle it get credit for their work if they make mistakes on the other work. The students can never get a mark of four any other way.

Representative HERBERT. Do I understand you to say no one ever passed a perfect examination in mathematics?

Professor HENDRICKSON. The mark four is given, but I mean to say the student could never get it without such a help as I have spoken of. No one can do mathematical work without making mistakes.

Representative HERBERT. I have seen many marked perfect.

Dr. MENDENHALL. I have seen many perfect examinations if the time is allowed.

Professor HENDRICKSON. If you give them time enough I grant it can be done.

Dr. GARLAND. In making up your examinations how many of the six questions will be altogether new to the class?

Professor HENDRICKSON. A very small proportion. I hardly understand what you an by new. In algebra we give problems taken from the text books.

Dr. GARLAND. Then they will have studied them. They are thoroughly versed or ought to be with the problems you select?

Professor HENDRICKSON. I don't aim to give very difficult problems for the examinations. We rather aim to bring out what the student has learned and knows well d can write down at once.

Dr. GARLAND. I was looking over some papers on the application of the equilibrium forces. These principles, of course, are old to the students, but are the examples give to test their understanding of the principles those with which they have en familiar?

Professor HENDRICKSON. The problems in mechanics would be given by Professor ce. I don't know anything about the particular examination he would give, but -- habit is to give examples which are taken from the books. Of course it is not sly that the students have worked all the problems out. Then in most cases there something new intended to try the best man.

MENDENHALL. I would like Professor Hendrickson to give us his opinion re- ve to the system of giving daily marks which is pursued in his department. y you think it adds success or efficiency to the work, or does it interfere with the nstructor as a teacher?

Professor HENDRICKSON. I think when the instructors are used to the system it be pursued with but little thought by them. The officers who come here as in- --ctors are familiar with the system, and you will find the students marking them- ves pretty nearly as well as the instructors will do it.

General WALKER. I understand Dr. Mendenhall's question to mean whether the mination is merely a means at getting at what the student knows, or is it an at- pt to instruct him?

Professor HENDRICKSON. I do not mark my section until the students have gone of the room. When they have gone, I put down what I think the recitation is --th.

MENDENHALL. What means have you of checking your own fairness of judg- m?

Professor HENDRICKSON. These things become a matter of habit to a man who is d to it, so that you don't have to pay any particular attention to it.

Dr. MENDENHALL. Are these marks not your personal impressions of the standing the young man rather than of the actual performance he gives at the time?

Professor HENDRICKSON. Perhaps they are, but that personal impression is what I t to give. A man comes to the recitation room and goes to work at some prob-

I may or may not have time to hear him recite. So with the others. But at end of the recitation I have a pretty good idea of what they have done. I do mean to say that I grade the class in one day, but at the end of a week they are fairly rated.

ral WALKER. What is the virtue of your monthly change of instructors so that --udent passes before four different instructors?

Professor HENDRICKSON. The students would not have the same instructor through the entire course, even if the instructors were not changed, as the sections themselves change. If the instructors kept the same sections they would not have the same men.

The PRESIDENT. Why not allow them to keep the same section?

Professor HENDRICKSON. All instructors are not equal in their method of marking and they are not equally liked by the cadets, who would not like to have the same men all the time. If the students have different instructors their marks at the end of the term will average fairly, showing their real standing.

The PRESIDENT. It eliminates any prejudices for or against them.

Professor HENDRICKSON. This rule is not understood to be a cast-iron regulation but has been adopted in justice to the students.

Dr. MENDENHALL. Is that custom pursued in the other departments—in the physical laboratories, for instance?

Professor HENDRICKSON. I am not positive. I think the work there is continuous.

Prof. J. M. RICE, professor of mechanics and applied mathematics, Naval Academy appeared before the Board.

Senator BUTLER. How long have you been a professor at the Academy?

Professor RICE. I have been here for twenty-six years. I came here in October 1863.

Senator BUTLER. What is your opinion as to the course of study pursued here now as compared to the course when you came here?

Professor RICE. It is vastly improved. The advance has been very great.

Senator BUTLER. State in what respect.

Professor RICE. The men come here better prepared. The mathematical course has been greatly increased and modernized. The course when I came here was very antiquated, but it has been made much more modern and arranged to cover more ground, and it does it better, so that for the time we have—I think the mathematical course, as a whole, is a very successful and satisfactory one.

Senator BUTLER. Do you think you have time enough for the course?

Professor RICE. I think we have. It would seem, of course, to persons accustomed to outside schools that we have not, and if any one should have asked me before I came here if it were possible to carry young men over the course we have I should probably have said no. But my views are entirely changed. We could use more time, but I don't think it would do much good to go more slowly.

Senator BUTLER. Do you think the cadets are as thoroughly instructed as if more time were given?

Professor RICE. I am under the impression that they are well equipped when they leave here. They are well enough equipped to get a subject up when called upon, and I have found when conversing with people who come in contact with our cadets elsewhere that there are very few who can use mathematics better than they. Our plan has been to take them over a good deal of ground, and although it would seem to one not familiar with the Academy that we go too far, I don't think we do on the whole. The stimulus we can bring to bear upon the cadets here and the fact that we don't get everybody in the service, that we are not obliged to keep a class back for the sake of one or two men who have no chance to get in the service, are great helps to us in pushing the cadets ahead. There is no reason why we should keep back the upper half of the class because of those who have no chance to get in the service any way.

Senator BUTLER. Do you think the present law has the effect of creating greater pressure among the students than there would be otherwise?

Professor RICE. It holds out a prize to a certain number. Those who are not able to get in the service are apt to get discouraged. It would be better if we held out more of these prizes, because those who have no chance to get into the service under the present law would then do better. But our system of study makes the upper men of great assistance to the lower men; greater here than any other place I have known. If there is anything taught to the upper section and not to the lower men they usually get it. Those cadets who go into civil life are pretty well equipped; that is, they have a pretty good foundation laid for success in whatever business or profession they may enter.

Dr. MENDENHALL. Is there difference in the courses of the different sections?

Professor RICE. Sometimes there is. There has not been any difference worth mentioning this year, but formerly we used to give what we called elective courses. That is to say, we took the upper section over in four days what the remainder of the class accomplished in five, and gave them advantages in the way of marks. That had a good effect throughout the class. It was a great stimulus to the lower men of the class. We are about starting that system again. We had that system in use in 1862, and with very good success.

Senator BUTLER. What are the text-books of your class?

or RICE. Rice and Johnson's Differential Calculus, Johnson's Integral Calculus, Walker's Analytical Mechanics, Cotterill's Applied Mechanics, Merriman's Method of Least Squares. We shall not use Merriman's Method of Least Squares yet. Professor Johnson is now writing a new book that will be the text-book for that branch next year. We find Merriman very unsatisfactory.

BUTLER. Do you have anything to do with the fourth class?

or RICE. I begin my instruction of students after they have been here two weeks. They have, in the mean time, completed algebra and trigonometry, analytical mechanics, both plane and solid. I begin with the calculus, and going through differential and integral calculus in the first term. In the second term of the second year I take them over mechanics. In the first class they have Cotterill's Applied Mechanics. Cotterill is professor of applied mechanics at Greenwich.

WALKER. I should like to ask Professor Rice if in his work in the calculus he has the students have all the instruction and drill in algebra which is required to work in the calculus easily?

or RICE. They come to me very well drilled. I could not get them over the fact that they were not well drilled previously. My course in the calculus is crowded with work.

WALKER. Is much importance attached in the Academy to the matter of making recitation room and blackboard prepared to make these prompt, handsome, effective demonstrations out loud, as is done in some institutions, enough to enable the student to understand the matter?

or RICE. I don't think we do give as much attention to that as they do at other institutions. We make our recitations rather subordinate to the examination system. We get all the work we can out of the students in the hour. We don't devote much attention to style, etc., as we might; we don't think it is so important. In a recitation ordinarily I have the work put on the blackboard. I don't go to the blackboard and read over equations, because it does no good. I show the student the equation number two from number one, and try to get at the point directly. It is at the expense of that style and manner that you will find a student prominent at West Point.

WALKER. Is the time that would be required to bring a class of students to a recitation room and blackboard prepared to make these prompt, handsome, effective demonstrations out loud, as is done in some institutions, enough to enable the student to understand the matter?

or RICE. I think there is a good deal of time wasted in stylish demonstrations. I don't think the style pays. True, it gives the man a certain amount of credit. Admiral Rodgers tried to introduce more style in recitations here when he was superintendent, but we rather fell back from it after he left.

SPENGLER. In your mathematical instruction is attention or encouragement given to original demonstration on the part of the student? Are they required to work on the board in accordance with the text-books or are they encouraged to give original demonstration?

or RICE. We always encourage them as far as possible in original demonstration. But we don't find a great deal of it.

WALKER. How many hours a week and how many weeks do you devote to original demonstration?

or RICE. About ten weeks; five recitations each week. You see it is a short

WALKER. We usually devote a whole year to it.

or RICE. We don't complete the book I use on differential calculus. I don't have more than half. There are subjects put into the books with special reference to the elective courses, and when we had the elective courses I took the men over the whole of the book. Now I cut out everything that is not absolutely essential. I try to put in everything essential.

BUTLER. Do you think the course you have just indicated, which must be rigid, is essential for the performance of the ordinary duties of the naval

or RICE. Yes, sir; it is essential for this reason: The courses in gunnery, architecture, navigation, etc., are directly dependent on the mathematical. It would seem to me a great mistake in studying navigation to take the course without demonstration. The cadets should be given a course that will enable them to understand the derivation of the formulas and fully comprehend their applications. If there was anything in my course that could be omitted, it would have no application in a naval officer's career. I should cut it out.

An illustration of this is seen in the study of the method of least squares. I don't teach that study, and I would not teach it if it were not absolutely necessary, because young men may be ordered on experimental duty to the observatory and elsewhere, and as you know, in nearly all tabulated work of a mathematical character, the method of least squares is employed. We don't turn out masters of this subject, but we give them sufficient knowledge to be of importance.



Dr. MENDENHALL. Do they make use of their knowledge of this study in your experimental work here?

Professor RICE. I don't know that they do. There is no reason why they should not.

Senator BUTLER. Do you think the course you have just indicated puts too great a strain on the boys to get the best results?

Professor RICE. I think not.

Senator BUTLER. Do you think your course gets the best results?

Professor RICE. I think so. They would not be able to stand the strain if it were as for the exercise they get in their drills. It takes a good deal of study to break down a boy who has plenty of exercise. We don't have such cases so far as I know. I think the doctor will probably agree to that. I don't think the strain is too great.

Representative HERBERT. How much time is given the students to answer questions at their annual examination?

Professor RICE. Five hours.

Representative HERBERT. What is the object in limiting the time to five hours? Suppose a student would answer every question if he had time, why not allow him to do it?

Professor RICE. There may be a difference of opinion about that. We give the marks on work done in a given time. At the annual examination, we could give them longer time, but it has been customary to mark on what they can do in a given time. If this were not so, I don't know how long a time some men would spend on their examinations.

Representative HERBERT. But would it not make a great difference in the estimation of some of the men, if full time were allowed them? Frequently, they work slowly and stand better and take a higher relative rank than others who excel them if limited in time.

Professor RICE. At our monthly examinations, each head of department is required to make his examination in his own period of two hours, because the next day he will be engaged for recitations elsewhere. My experience has been, that a good many of the cadets will stay at their examinations as long as you will let them. At the annual examinations we have for the annual examinations is from 8 to 1 o'clock, with an interval of twenty minutes. We might make the time from 8 to 2, but I don't think it would be wise to do that.

Representative HERBERT. But does not this system result in making the rapidity at which a man can work, rather than of the thoroughness of his knowledge?

Professor RICE. If a man is thoroughly conversant with the subject, the examination is sufficiently long for him. The examination is usually rather more than the student can accomplish in the time given. We aim to make the papers long enough to test not only the lower but the upper men of the class. If we were to give a student an easy paper, the upper men would get a perfect mark and we should fail to test the class.

Representative HERBERT. You grade the upper part of the class by the time given?

Professor RICE. I doubt whether more time would help the lower men out.

Representative HERBERT. Has the time given for the examinations always been limited?

Professor RICE. I think some years ago we did not limit the time as closely as we do now. I am under the impression that when Admiral Porter was here we gave them unlimited time, but I don't think it would be expedient to do that now.

Representative HERBERT. Why not dispense with something else, in order to give more time for examinations, that the knowledge of the students may be better tested?

Professor RICE. There is a certain amount of time assigned to each department. I could not take the time assigned to another department. If I did, it would be to the disadvantage of the students to lose advantages elsewhere and would interfere with the entire course.

Representative HERBERT. So you are so greatly pressed for time, that you cannot stop to give more time to examinations?

Professor RICE. No, sir; it is impossible under our present system. There would be a great waste of time for the bulk of the class were we to do so.

Senator BUTLER. What proportion of the graduates who are turned out of the service get into the service as compared with those entering twenty years ago?

Professor RICE. I should think we get into the service about two-thirds the number that got into the service twenty years ago.

Senator BUTLER. I speak of the percentage of graduates?

Professor RICE. I think it is much larger.

Senator BUTLER. Do you take into consideration the increased number of Representatives in Congress? There are three hundred and twenty-five Representatives in Congress now, as compared with one hundred and twenty-five twenty years ago. Is it entitled to nominate a cadet?

Professor RICE. I mean that of a class of a hundred the proportion of

was than it was formerly. I helped to make up some figures in regard to '64. At that time, of the whole number sent us, about one-fourth got rid of those who were admitted about 32 or 33 per cent. graduated. About half of all who came got through ultimately and of those who went in about half graduated. I have not made up the statistics for the present time, but I proportion is much larger.

BUTLER. The proportion of graduation?

MR RICE. The proportion of graduation, I think, is larger. We get more than we used to. The statistics we made up in 1864 went back to 1845, graduation of the Academy.

MR HERBERT. Are those figures accessible now?

MR RICE. I think they could be found. I could not put my hand on them now.

MR HERBERT. I wish you would get the figures and append them to the report.

BUTLER. What do you think would be the effect of reducing the standard of the course at the Academy somewhat and then adding a post-graduate course for young men who have a special aptitude for scientific studies?

MR RICE. I don't think the standard need be reduced very much. I don't think it necessary to reduce the standard very much, though we could then get a better through, if these young men were made officers on graduation. It would ease the size of the class and we could graduate a much larger number. We get pretty much all through now who have fair or moderate ability. The ones who don't get through are those who don't work. The course is not so difficult, now, but that the students can get through it if they work.

MR DENHALL. Under the present system, the men who stand highest in the class are the ones who get into the service. Is the system of instruction which you use with the examinations and daily marks, the best system for selecting that class of graduates who will be the best officers of the service? Is it the best system for making the selections?

MR RICE. I think so. I think we can not do any better. Cadets sometimes have valuable qualities that we can not find out, but I don't know anything better than the present system for getting at them. If I knew anything better I should advocate having tried every means to get at the value of cadets; among others, the working for practical seamanship and navigation on practice ships.

WALKER. Of a class of ninety entering the Academy I believe sixteen get into the service. Of these sixteen, how many, speaking very roughly, because it is an impression to a certain extent, would not be among the first sixteen scholars in the recitation room? Of their number how many would be promoted for their work in drills and practical exercises?

MR RICE. That question is rather difficult to answer without some actual figures. The men are credited for their work at practical exercises to a certain extent, and the sixteen entering the service would be the sixteen best scholars. At least two or three of the number get into the service through efficiency in the class, but I think the number is not very great.

WALKER. Not more than two or three out of sixteen?

MR RICE. We have tried all the means we know of to get at the practical work of the men.

MR HERBERT. How do the discipline and morality of the cadets compare with twenty years ago?

MR RICE. They are much better now.

MR HERBERT. Has there been a continuous improvement in that respect?

MR RICE. Yes, a continuous improvement. There is less dissipation among them and they are generally more disposed to conform to the regulations of the Academy than they were twenty years ago.

MR HERBERT. How do the last twenty men of the class compare with the last twenty standing twenty years ago?

MR RICE. They are better trained men now.

MR HERBERT. Has the act of 1882 had any effect upon their standing?

MR RICE. They have been better trained men for a long time than they were before the war.

MR HERBERT. Do the men in the lower part of the class study as diligently as they did prior to the act of 1882?

MR RICE. I don't think they study quite as well. There is some difference, but I don't think it is much. It is not as great as one would think. I suppose some of them are lazy, though there are others who feel that they are laying a valuable foundation for doing something outside the Academy, and that acts as a stimulus.

MR HERBERT. Do you think the number of men to whom the course is really valueless is any greater now than prior to 1882?

Professor RICE. I do not think it is greater. At any rate, not much. I have thought that I noticed a little lack of zeal on the part of some. Previous to 1883 we did carry the class over a more extended course, but that was partly due to the elective courses which I have mentioned and partly to the fact that the cadet-engineers were here.

General WALKER. Do you think the presence of the cadet-engineers effects the rest of the students?

Professor RICE. I think it did. The cadet-engineers were selected by competitive examination. They were the better prepared men and their course covered considerable more ground than that of the cadet-midshipmen.

General WALKER. Were they the leading scholars?

Professor RICE. Yes, they were the leading scholars—the best prepared men. We had one young man sent here from Richmond, who had been through analytical geometry and calculus, and he was only seventeen years old. We had a great many men come here as cadet-engineers who were very well prepared. I don't think there is any doubt about the value of the post-graduate course, and it might very easily be established here. It would not even require any legislation, if the Secretary of the Navy should wish to order it.

Senator BUTLER. Could the Secretary of the Navy do that without the authority of Congress?

Professor RICE. I think so. All he would have to do would be to pick out some of the young graduates and order them here.

Senator BUTLER. Would any additional preparation be required at the Academy?

Professor RICE. No, sir.

General WALKER. The presence of such post-graduate students would be an inspiration to the cadets, would it not?

Professor RICE. Yes; no doubt. They might be utilized for drills, too. I don't suppose we should maintain strict discipline with them. They would be ordered to sea if they did not improve their time.

Senator BUTLER. Don't you think it would be a very great advantage to have a post-graduate course?

Professor RICE. I do, indeed; the cost to the Government would be very little; I don't think it would require any appropriation or legislation.

Representative HERBERT. Would it not require an increased plant, such as steam-engines, ships, models, and such things necessary to study?

Professor RICE. We should use the recitation rooms we now have. We should require a few more models than we have for the use of the instructors.

General WALKER. Those would be the things you ought to have anyhow; that is, the modern approved appliances?

Professor RICE. Yes, sir.

Senator BUTLER. You don't think it would be necessary or advisable to simplify or reduce the course of study, to have this post-graduate course, do you?

Professor RICE. What we should probably do would be to take some studies out of the regular course and put them in the post-graduate course. There are some subjects we feel compelled to teach as absolutely necessary, that we might be able to put in the post-graduate course.

Senator BUTLER. What men would you expect to put in this post-graduate course; men who don't want to go in the service?

Professor RICE. My idea would be to make it an entirely voluntary course. I would not have any man take it unless he did so voluntarily. I would let the men elect the courses they desired to pursue. There are certain officers who have specialties and they would find great advantage from such a course.

Professor ROOT. What would be the influence of adding a year to the school course as now arranged?

Professor RICE. I hardly think that would be expedient. We don't want young men to wait too long before going to sea. I doubt whether the additional year would be expedient.

Professor ROOT. Would it be of advantage to raise the requirement for entry to the Academy?

Professor RICE. To a certain extent, I think it would.

Professor ROOT. Your requirements are now behind those of the colleges nearly a year?

Professor RICE. I don't see why that should continue. But the students in each Congressional district and we have had to keep the standard down a little because of that.

Professor ROOT. Do you believe there are boys from any of the districts, who acquire algebra through simple equations, who could not go through quadratics?

Professor RICE. No, I don't think so.

Professor ROOT. Could not the first four books of geometry be obtained in mission examination?

Professor RICE. I think that might also be put in. We should have to do these things gradually, so as to give the members of Congress due warning, but I don't think there is any practical difficulty in raising the standard.

General WALKER. Suppose it were provided that young men coming to Annapolis should be appointed a year in advance, so they would have that time to prepare themselves. Would there be any difficulty then in securing the additional instruction?

Professor RICE. I think there would be no difficulty. I think it would be a good plan if they were appointed a year in advance. No objection against that plan occurs to me.

General WALKER. The effect would be to lighten their work during the regular course here.

Professor RICE. It is to be hoped it would not increase the age of admission. The age is now about as high as it is desirable to make it.

Representative HERBERT. What do you think about establishing a maximum age for admission at twenty years?

Professor RICE. That is too old. It would be a mistake to make the difference between the youngest and the oldest of the cadets any greater.

Representative HERBERT. It is now five years. Do you think that is too great a difference?

Professor RICE. Yes, I think it would be better to take a year off the upper limit. The average age of admission has been about seventeen years, but the increase of the upper limit will have the tendency to increase it.

General WALKER. A young man coming here at nineteen or twenty years of age is less pliable and adaptable than if he came at seventeen?

Professor RICE. I think so, and everybody's experience is that a young man going from here to sea at twenty-three years of age is too old to break in to that kind of life.

General WALKER. What is your opinion regarding the requirement of a two-years course at sea before final graduation? What is your observation relative to the comparative merits of the examination before and after that two-years course?

Professor RICE. I think no great advantage is gained by that two additional years at sea. My opinion is that it would be better to give the cadets their commissions when they get through here. The present system is expensive and I don't think the results pay for the trouble.

General WALKER. As I understand, at the end of that two years a re-examination is held, covering the same ground as the examination before the cruise. How does their knowledge of the subjects they study and their practical ability to use what they have learned, at the end of the two-years course, as shown by their examinations, compare with what they could do before that course?

Professor RICE. As far as their knowledge of books is concerned I don't think they show much advancement. They make progress in the languages, and their experience at sea gives them knowledge of the subject of steam-engineering, but I don't see any great improvement in their examinations. I don't think the results of the two-years course are worth the trouble and expense that it costs. The argument in Washington is that these men who go to sea for two years constitute a naval reserve in time of war. But the graduates who don't get into the service don't go to sea. They go into every other line of business. They go into brokers' offices, and engineers' offices, etc. If a man has been in civil life for ten years there is no place for him in the Navy.

General WALKER. Do you mean he would not be valuable?

Professor RICE. A man could not go back in the Navy and take a rank along with his classmates. The advances in the service would not allow that, and he would not be able to fill such a place.

General WALKER. The best officers on both sides of the civil war were men who had long been out of the service.

Professor RICE. But that would not be so in the Navy. The volunteer officers who came into the service during the war were not, on the whole, very useful. They were sometimes ignorant and inefficient and sometimes dissipated. They were, with some notable exceptions, not very useful men. I think everybody who remembers about it will say that. There were a few who did excellent service.

Commander C. D. SIGSBEE, U. S. N., head of department of seamanship, naval tactics, and naval construction, appeared before the board.

The PRESIDENT. You are familiar with the act of Congress to regulate the course of the Naval Academy, approved March 2, 1889?

Commander SIGSBEE. I am.

The PRESIDENT. The second section of that act states that after March 4, 1899, the minimum age for admission of cadets to the Academy shall be fifteen years and the maximum age twenty. What are your views on the effects of this legislation?

Commander SIGSBEE. I favor the advance of the minimum and acquiesce in the maximum.

The PRESIDENT. You see no objection to a candidate being twenty years of age before entering the Academy?

Commander SIGSBEE. My chief objection is that a cadet or young officer will be at a low grade when he is rather old.

General WALKER. Is not the older student less adaptable to the requirements of the service?

Commander SIGSBEE. I don't think he would be more so. I think the change will produce more stagnation in the service than we have now. My idea is that the officer ought to have his first command at thirty years of age, in order to have the proper incentive to effort. Responsibility is a great educator, and if we fail to invest an officer with responsibility when he is young he gets into a rut.

General WALKER. You consider the advance from fourteen to fifteen years in the minimum age for admission desirable?

Commander SIGSBEE. I consider that excellent, as being likely to enable boys from sections of the country where schools are not so good to compete on better terms with boys from more favored sections.

The PRESIDENT. Where do you think the best schools exist?

Commander SIGSBEE. The general impression is that the schools of New England are the best.

The PRESIDENT. It has been suggested that it will be for the best interest of the service if cadets are graduated at the expiration of the four-years course at the Academy and commissioned as ensigns at once. What are your views on the subject? Is the present method an advantage or disadvantage to the boy and to the service?

Commander SIGSBEE. I think by all means those who go into the service should be commissioned as ensigns at the end of their four-years course. To give a man scientific education in this school and then send him to sea and give him duties that are degrading, and that should be performed by the sailors, is not calculated to act as an incentive to effort on his part. At present the petty officers on board our ships have almost no responsibility whatever. The consequence is it hurts the sailor, while the petty duties are given to the officers, who are educated for greater things. Theoretically, a young officer is educated up to the grade of an admiral, and then we send him to sea, and he does only these trifling duties. It is absurd. I wish to say in this connection that, while I have always made young officers stand up to the duty as laid down at present, I have always disapproved the system. The case of the graduates of this school is parallel with that of the graduates of other schools. A doctor begins the practice of his profession at once. He does not clean instruments nor assist nurses for a time after he graduates. With this change in the age of admission comes the greater necessity of giving the young officer responsible duties at once.

General WALKER. Your opinion is that the practice cruises will give all the drill to enable the cadet to become an ensign?

Commander SIGSBEE. Yes; but practice will improve him, as in any pro

The PRESIDENT. Now a cadet gets a month's leave each year after his summer or after his summer at the Academy. Do you think that is an advantage over the old system?

Commander SIGSBEE. I think it is a disadvantage, because it takes part of the year to go away each year. It is likely to leave him less money on graduating and obliges him for study at the beginning of each academic year. At the end of the year I would give him two months, returning to the old practice. I think three months would be too long.

General WALKER. I should like to ask Commander Sigsbee whether the course of study at the Academy to be too severe, considering the age and the development reached by the cadets? Is it too severe in the sense of their growth or reducing their vitality or keeping them in a strained condition? Does your observation show this result?

Commander SIGSBEE. I do not find that it has that effect. It must be remembered that the boys who enter here are physically sound. They are every year physically. They have a regular diet and regular habits and athletic in every way. We find that when bail clubs come here from other colleges, compete with the cadets, the latter are, in almost every case, the finer body. In almost every case the cadet shows greater endurance. They play the latter part of the game.

General WALKER. But are these not picked men?

Commander SIGSBEE. They play against picked men, men picked from students.

General WALKER. Do the others show any signs of loss of vitality or

Commander SIGSBEE. I have not observed that they do. My observa-

among those of the first class, who are also under my observation on board ship, where a lack of physical quality would be likely to show itself.

General WALKER. Do they appear like young men under good conditions?

Commander SIGSBEE. I have generally found that when worked hard for four hours on board ship, in the hot sun, numbers of them took to skylarking when they are at ashore. I think we could push them harder here. I think they are better able to stand the strain than the average outside student, on account of the regularity of their life.

Representative HERBERT. When did you graduate?

Commander SIGSBEE. In 1863.

Representative HERBERT. Were you familiar with affairs at the Academy after the close of the war?

Commander SIGSBEE. Not strictly. Only in a general way. My first term here as an officer was in 1870.

Representative HERBERT. How does the present course compare with that of 1870?

Commander SIGSBEE. I should say it is a little more severe, because, when they merged the two courses (cadet-midshipmen and cadet-engineers) there was a tendency to preserve all they could in each course; but I should not like to go into details without consulting books.

Representative HERBERT. What studies have been added since that time?

Commander SIGSBEE. I would not like to state without looking at the books. I do not know of any absolutely new subject except hygiene. The elements of mechanism and a little more extended course in steam were retained, in order not to lose what was good in the cadet engineers' course.

Representative HERBERT. Was the course in mathematics extended?

Commander SIGSBEE. I think no more mathematics was given.

Representative HERBERT. I would like to have some statistics showing how the course compares now with what it was twenty years ago?

Commander SIGSBEE. If you will let me go back to 1859 I can answer more definitely. At that time there was too little in the course. I don't think I am exaggerating when I say that many boys got through on no more than one hour of study per day.

Speaking for myself, I got through on less than that the first year, and completed the second on what I learned in the first. From 1859 to 1863 I don't think I averaged three-quarters of an hour study per day. Brighter students may have found it easier.

Representative HERBERT. How do failures now compare with previous years?

Commander SIGSBEE. If you mean failures to enter, the examination for entrance more difficult now, but not more difficult in comparison to the requirements of the naval service at the present time. The statistics of the Academy can be obtained from the Superintendent's office.

General WALKER. Is it your opinion that the average American boy will go through larger course of study at this time without greater effort than he would have twenty years ago?

Representative HERBERT. Have we not better text-books?

Commander SIGSBEE. We have better methods than were in use twenty years ago. The great trouble we have with the cadets is that they do not know how to study when they come here. Any bright boy coming here is likely to go through if he is well grounded and determined to succeed.

Dr. GARLAND. Do I understand that in 1859 an average student could have accomplished successfully what was required of him by the study of an hour a day, or one hour for each recitation?

Commander SIGSBEE. I think he could have done so by studying only one hour a day from 1850 to 1863, especially if he were as well grounded in his studies as the cadets who come here to-day.

Dr. GARLAND. How many recitations a day had you then?

Commander SIGSBEE. The same as now; three per day. The standard of studies was very low comparatively.

Dr. GARLAND. Then you time to prepare for each recitation would not average more than twenty minutes?

Commander SIGSBEE. I learned all my geometry between dismissal from breakfast and study hours, and that was about twenty minutes; I got through all right, too. The Academy was, in those days, very slipshod.

Dr. GARLAND. Now you give scholastic work, which it is supposed will occupy the average student about six hours in twenty-four in its preparation. Then you have added three hours for the recitation, which will bring it up to nine hours. So the student will be engaged nine hours in the twenty-four either in the preparation of scholastic work or in recitations. Is that a correct estimate? A student recites three hours a day, and you suppose that two hours are required in the preparation of each of his recitations. I want to get accurately at the number of hours that a young man of average ability will require to prepare himself for the scholastic work here.

Dr. MENDENHALL. Last night the whole time was stated as forty-eight hours week, exercises, drills, and all.

Commander SIGSBEE. Professor Hendrickson, who is here to be heard, will give you information of anything connected with the niceties of the time of study much more readily than I. When I was here as a student the work in the department of drawing was chiefly a skylark. It was not serious work. In certain other departments it was not much better, as the discipline was imperfect.

Senator Teller here read a letter relative to the course pursued at the Academy [The letter complained of the severity of the course and that instruction was not given to cadets at recitation.]

Commander SIGSBEE. Referring to the letter which Senator Teller has just read to the severity of the course, I will say we graduate at this time double the number of men who are required in the naval service under the law. The classes average thirty-five or thirty-six members, while but seventeen or eighteen of them have been taken into the Navy. Since the idea of the Academy is to educate officers for the naval service, I think this shows that the course is not too severe. If the course were to be lowered the result would be, as it appears to me, that the cadets who would get in the Navy would not be so well educated, and therefore the main purpose of the Academy would not be as well carried out. The cadets who would fail to get into the Navy, and who would therefore be returned to civil life, would be less well educated than they are at present, but a few more would be graduated probably. But, the main purpose of this Academy being to educate officers for the naval service we would make a great mistake should we fail to get the most from men going into the Navy, remembering that the scope of the naval officer in a scientific direction has been very much increased during the last fifteen or twenty years.

Your correspondent is wrong in his conclusions [addressing Senator Teller]. The scholars are instructed in the class room. I was in Prof. Hendrickson's class room one day and he kept cadets continuously at the board, and as fast as they completed one problem they received another. Prof. Hendrickson tried to satisfy himself that the scholar thoroughly understood the principles involved in the exercise. I regard his practice as an ingenious method of instruction. I have issued an order in my department to the effect that a cadet shall be kept under instruction in the instruction room, that the instructor may explain to him any past lesson or future lesson, as this is done over and over again in my sections. In addition we have a great deal of practice. It may be that the instruction might be done still better, but I know this is an effort to instruct in the instruction room.

General WALKER. You spoke of explaining lessons in advance. Is that habitual?

Commander SIGSBEE. It is in my department, because I think I can make better seamen of the cadets by much repetition. In naval architecture and in construction I allow it to a certain extent, though it is not so necessary in those studies. I will say to the Senator that during my time of study here from 1882 to 1885 I received letters of the kind he has read to us, from an old naval officer, who gave me supposed statistics, showing that the course should be abated. I read his letters to members of the academic board, as I supposed he wished. In seven out of ten instances his inferences were wrong; they were based upon the ideas of his son, a cadet, who was not doing well and was accordingly dissatisfied. Of course, people outside have not the statistics at hand and their conclusions are likely to be erroneous.

Senator BUTLER. Do you believe that more men are being graduated than will be required in the naval service?

Commander SIGSBEE. Yes, I think so; as the Navy is now organized, and under the present system, we get the best men as a rule—those who are at the top of the class. We miss some good men, undoubtedly. It is almost impossible, at the Navy Academy, to judge as to one of the most valuable traits of the naval officer, that is his officer-like qualities, and the only advantage of the two-years course at sea is that we do then, in some measure, get a knowledge of those qualities.

Senator BUTLER. Was there any restriction put upon the number of cadets who entered the service previous to the act of 1882?

Commander SIGSBEE. Not that I remember.

Senator BUTLER. Then the graduates prior to that were always absorbed by the service. Do I understand you to say that the increased population of this country and the probable increase of the naval establishment will not cause all the graduates to be absorbed by the service?

Commander SIGSBEE. You must increase the number allowed in the several grades, and with a change of policy this may be done with economy. Our Navy should be capable of sudden expansion in time of war, because we never will have a large peace Navy relatively to other countries. We now take our paymasters from civil life while we return some of the graduated cadets to civil life. If the latter were put into the line and then assigned with other line officers, in turn, to pay duties, on cruise, they would be available in expanding the service in time of war, for we could then fill the places in the Pay Department from civil life. I would have no permanent

orps. A line officer should be assigned to a ship as pay officer for a cruise, as now assign one as navigator. In this way the officer and graduate would not surr his military character and usefulness.

representative HERBERT. Do you think the Revenue Service ought to be officered graduates from the Academy?

Commander SIGSBEE. By all means, and by assignment in rotation or turn. The ne personnel should lose its identity in the Navy personnel. I would apply the principle as in the case of paymasters, the principle that now holds with Coast Survey.

ator BUTLER. So you think by adopting that course the entire number graduates could be taken up in the service?

Commander SIGSBEE. I think in time it would provide for most of them, if not all.

representative HERBERT. Senator Butler, referring to your question about the er of cadets being all absorbed in the service, you will remember that the number of members of the House of Representatives was increased after the census of 1870 and increased again after the census of 1870; so that there are a very much r number of cadets allowed at the Academy than heretofore. This act of 1882 passed at a time when the number of line officers ran up to 1,100, and then d the number to 700. I remember that the Navy was getting top-heavy with ge number of officers. The act provided that after that the number of line rs should be about 750; the number of engineers was limited to about 170; and umber of paymasters to 90; and to make this decrease it provided that until umber in the different ranks were reduced to these figures there should be ne appointment to every two vacancies, and provided further that there should least ten graduates go into the line every year from the Academy. That has the law up to the present time, except the change made in the last Con- when the limit of those who should enter the Academy was raised to 15, the er of line officers having been reduced to 750. The number of the engineers down yet to the prescribed limit, as is the case with the number of paymas- Congress believed at that time we would not need more than that number leers.

ator BUTLER. I remember the legislation, and I never agreed with it. While true the increase in the number of Representatives has been going on, the er of graduates has not increased in the same proportion. The number of iates has been diminished.

representative HERBERT. There has been a considerable increase in the number val officers by reason of the war. There was quite a number of volunteer officers who were kept in the service, and there has been no increase from that source. perfectly clear that officers for the Revenue Marine Service should be taken this school, and I think this board ought to recommend that it be done. Government already educates these officers for the Revenue Marine Service ard of a school-ship.

Commander SIGSBEE. In other words, there is an incipient Naval Academy there.

representative HERBERT. All the officers should be taken from this school for Revenue Marine, and we might go further and put some of them in the Light-e Service.

Commander SIGSBEE. While we are speaking of our naval reserve it is well to mber that you can not make a line officer of a second mate as you did during the

So if we can not retain the graduates of the Academy in the Navy, retain them where where they may keep in a reasonable amount of practice at least. In time r those in the Coast Survey, Revenue Service, Fish Commission, and on pay duty l be restored to line duty without trouble. It would be very difficult to get men to deal with our high-power guns and varied mechanism in moments of gency. The country is beginning to recognize this now.

General WALKER. It seems to me that the minute familiarity with our coast pos- ed by our Revenue Marine officers, which they get by going into every bay where ling takes place, in time of war would become very important. That alone is ent argument of their value as naval officers in time of war.

Commander SIGSBEE. If an officer should make a cruise on board a naval ship and one on board a revenue vessel, that would be better than to separate the two ces. In respect to paymasters, I repeat that I would not have them a separate e. I would have an officer detailed for paymaster's duty for a cruise. A lieuten- for instance, would be detailed for paymaster's duty, and a great deal of clash- ould cease. In time of war this officer could take charge of a ship's battery, or sion of it.

. MENDENHALL. I suppose if the Revenue Marine were placed under the control e Navy the demand for officers would cause all the graduates of the Academy to bsorbed. The Secretary of the Treasury said a few weeks ago that there are ships under his Department than there are in the United States Navy.



Representative HERBERT. The law would not propose to displace officers who are now there, but to fill vacancies as they occur.

Commander SIGSBEE. My opinion is that every loophole in the Government service that can be found that will give a naval officer an opportunity to practice the legitimate functions of his profession should be filled with graduates from this Academy. Take, for instance, the positions of inspectors of steam-boats, the appointment to which might be so arranged that we would have a great number of people to draw from for the naval service in time of war. During the late war the officers from the Coast Survey were known for their excellent handling of ships in the blockades.

Representative HERBERT. And that contributed very largely to the efficiency of our blockades.

Senator BUTLER. What is your opinion relative to the advisability of establishing a post-graduate course here?

Commander SIGSBEE. I have never given that enough thought to offer a valuable opinion, but I think a post-graduate course might be established here. I remember you asked me, informally, why we could not establish a post-graduate course here for the study of naval architecture. I hope to see the time when that may be done in this country, but the time for it has not yet come. If you want to make a finished musician, you must take the student to musical centers. A similar rule applies in making a naval architect. I think the advantages for the study of naval architecture abroad, are much superior to those we have in this country at present.

Senator BUTLER. Don't you think this is a good time to make a beginning?

Commander SIGSBEE. I think it will be in a few years. Perhaps in five years we may be able to do so. I think for the present it is better to send our young men to be educated in the higher branches of ship-building abroad. It is better for the service to continue that practice for a few years longer. When we are provided with models, and are properly equipped to instruct the men here, then will be the time to go ahead with the work.

Representative HERBERT. We have already established a War College. We have provided them with a building and started a torpedo school, and made very liberal provisions for carrying on the school.

If you were to start a post-graduate course, would you do so in addition to this college, or would you simply improve that?

Commander SIGSBEE. Without regard to the War College. Mathematical and technical subjects might be taught here as a post-graduate course. [Reading from a pamphlet of Proceedings of the United States Naval Academy, called *Progressive Naval Seamanship*.]

"It is believed that this tendency will serve to remind line officers, more strongly than any expressed opinion, that as a class they must give more study to the science of mechanism.

"Since the duty of engineers lies almost wholly with machinery, and their title implies the fact, it is not questioned that they should study that science, but it seems to be not generally recognized that the line officer's duties now include a wider range of mechanism than the engineer's. For example, I may mention the instruments of precision, relating to astronomy, navigation, meteorology, electricity, and ordnance; the mechanism of small arms, great guns, torpedoes, rapid-firing guns, dynamite guns, steering apparatus, and deep-sea exploring apparatus; the machinery for the manufacture of great guns and their mounts; for the manufacture of rigging and other articles of equipment; and finally, the steam-engine, in degree second only to that of the engineer himself. Yet this enumeration does not fully state the case."

My object in reading that is to show that there is reason for extending the study of mechanism in the Navy; and again to emphasize the fact that it is impossible longer to derive educated seamen for the naval service from the merchant service in the event of war. At this point it serves as an argument in favor of the employment of naval officers in the revenue marine and other services in order that we may retain a maximum of trained officers at the least expense. When we had only one type of ship and one type of gun a person might have learned to operate them by a comparatively small amount of practice. But this is no longer the case with our complicated mechanism, and the remote possibilities of war must be provided for by a theoretical as well as a practical knowledge. With a post-graduate course both practical and theoretical ends would be served, of course.

Lieutenant-Commander ASA WALKER, U. S. Navy, head of department of astronomy, navigation, and surveying, Naval Academy, appeared before the Board.

The PRESIDENT. Mr. Walker, will you state to the Board when you entered the Academy, when you graduated, and what your service has been here since graduation?

Lieutenant-Commander WALKER. I entered the Academy in 1862, graduated in 1866, and in 1873 was ordered to the Academy as instructor in the department of mathematics, serving there for three years. In 1879 I was again ordered here in the

same department, remaining for four years, and again in 1886 came here as head of the department of astronomy, navigation, and surveying.

The PRESIDENT. Then you have been an instructor here for ten years. How does the course of studies in the department of which you are the head compare with the course during the time you were a student and cadet? Is it about the same course, or has anything been added to it since that time?

Lieutenant-Commander WALKER. The study of the deviation of the compass has been added. At the time I was here as a cadet the study of navigation consisted simply of a solution of the astronomical triangles as applied to navigation. Since that time the study of the deviation of the compass has become a necessary study.

Senator BUTLER. Does your instruction begin with the fourth class? What text-books have you?

Lieutenant-Commander WALKER. I begin with the second term of the second class, thence through the first class. The second class text-books are White's Astronomy and Chauvenet's Spherical and Practical Astronomy, Bowditch's Navigator, American Ephemeris, and Nautical Almanac. The text-book on navigation used by the first class is one compiled by myself, accompanied by Bowditch's Navigator. The text-books on deviation of the compass are selections made by Commander Howell, now Captain Howell, from the Admiralty Manual, "Deviation of the Compass," and Evans's Manual, "Deviation of the Compass." "Howell's Marine Surveying" is also used.

Senator BUTLER. Do you find that the cadets have time to go through that course? Lieutenant-Commander WALKER. I think they have. They have all succeeded in getting through since I have been at the head of the department.

Senator BUTLER. You think it is not too great a strain mentally or physically for them?

Lieutenant-Commander WALKER. No, sir. Navigation is simply the application of what they have learned in previous years to a new subject. They do not have to acquire any new principles. In the study of the deviation of the compass they have the application of what they have learned of magnetism, and in all of the other departments their study is only a similar application of what they have learned. There is absolutely nothing new.

Senator BUTLER. Are your appliances for teaching, in the way of practical demonstration, sufficient?

Lieutenant-Commander WALKER. They are very good.

Senator BUTLER. Have you all the apparatus that is necessary and that you would like to have for teaching astronomy?

Lieutenant-Commander WALKER. There is not time allowed to enable the students to become thoroughly accurate in the study of astronomy. For them to become thoroughly proficient, would require a great deal more time than could be devoted to it. We give them an outline of astronomy. The instruments that we do put in their hands are the sextant and the theodolite. These they manipulate and become familiar with. Each room (the students' room in pairs), is provided with a sextant, and they are allowed to handle it and work with it, at any time they may see fit, and after the weather becomes suitable in the spring, they take daily observations, using the artificial horizon and the azimuth compass, such as they are required to do in actual service.

Dr. MENDENHALL. In your work with the students, do you teach the methods of determining latitude and longitude, and the position of the ship at sea?

Lieutenant-Commander WALKER. Yes, sir.

Dr. MENDENHALL. Do you go into the deviation of the compass thoroughly? Do you determine the constants of the compass?

Lieutenant-Commander WALKER. We endeavor to do so. We have been in the habit of swinging the monitor *Passaic* and determining her constants.

Dr. MENDENHALL. Do you work in the pendulum vibrations, determining the intensity of gravity, etc.?

Lieutenant-Commander WALKER. No, sir. I do not. These experiments are performed in the department of physics and chemistry.

Dr. MENDENHALL. I would like to know how accurately you can determine the position of a ship at sea; how accurately you attempt to do it when afloat?

Lieutenant-Commander WALKER. It depends entirely upon circumstances. Under favorable conditions, I think I could assure the position of a ship within five miles. Under other circumstances, it might be within a radius of five miles, that would be ten miles. At times I could determine the position closer.

Representative HERBERT. Do you know what new study the addition of which has crowded out the study of international law from the curriculum of the Academy?

Lieutenant-Commander WALKER. I am under the impression it was astronomy, which is the new subject in my department, in the second class.

Senator BUTLER. Have the subjects of physiology and hygiene been the cause?

Lieutenant-Commander WALKER. Partially. Astronomy was taken from the first class and made a second class study.

Representative HERBERT. Do you think the study of astronomy is more important to a naval officer than is international law?

Lieutenant-Commander WALKER. It is absolutely essential.

Representative HERBERT. Don't you think international law is absolutely essential?

Lieutenant-Commander WALKER. Yes, but not so essential to a young officer as astronomy. Every naval officer is examined on the subject of international law, for promotion to command grades.

Senator BUTLER. But a young man wants to study law when young.

Representative HERBERT. In your opinion it would be better to exclude international law from the course here than to select one of the sciences and exclude it in order to give place to international law?

Lieutenant-Commander WALKER. I think so. This course was carefully considered by the Academic Board, and the argument advanced by Commodore Brown to the effect that the naval officer is not called upon to exercise a knowledge of international law until he reaches riper years, during which time he would have read up on the subject, as it would be a part of his profession, and in view of his examinations meets the objection to the study not being pursued now. Of course, such study would be advisable, but when the Academic Board considered that it would be pursued at the sacrifice of more important branches, it concluded to exclude it.

Representative HERBERT. Was the study dropped last year?

Lieutenant-Commander WALKER. Yes, sir.

Representative HERBERT. Had it not always been studied up to that time?

Lieutenant-Commander WALKER. Yes, to a certain extent. When I was a cadet we studied, or rather read, Kent.

Senator TELLER. Were you examined in that as in other studies?

Lieutenant-Commander WALKER. Yes, sir.

Senator TELLER. How much time do you now devote to physiology and hygiene?

Lieutenant-Commander WALKER. Twenty periods.

Professor GARLAND. Do you consider that the chronometer in its perfected state has displaced the practice of determining the longitude by lunar distances? Do you teach the cadets to determine the longitude by lunar distances?

Lieutenant-Commander WALKER. No. They are told that if they wish to investigate the subject further than they are taught in class, they will find it fully explained in a treatise by Professor Chauvenet.

Professor GARLAND. I think the reward that was given by the Government was for the determination of the longitude within three marine leagues.

Lieutenant-Commander WALKER. I think the first reward was for the absolute determination within 30 miles. As the improvements for doing the work have been perfected the distance has been shortened.

Professor GARLAND. You did not have reference to the determination of the longitude by lunar distance, when you stated that you could determine a ship's position within 5 miles, did you?

Lieutenant-Commander WALKER. No, sir. In any passage we are apt to make, in modern times in steam-vessels, the chronometer should be very accurate.

Professor GARLAND. Certainly the method by the chronometer is greatly superior.

Lieutenant-Commander WALKER. When we take into consideration that the probable error of an observation is 40 or 50 seconds in the measured distance, and that 10 seconds error in a lunar distance makes 15 seconds of time in error in longitude, we see that the margin of error becomes very broad. That will be taking it under the most favorable circumstances.

Professor GARLAND. Do you use Baldwin's repeating circle to give the position more exact? Theoretically, it is much superior to others in use?

Lieutenant-Commander WALKER. I have never used repeating circles. They are too heavy and cumbersome for use at sea. While the errors to which we are subject are so unknown, as they are at sea, critical accuracy of measurement is hardly practicable.

DR. MENDENHALL. How many chronometers do you usually carry at sea?

Lieutenant-Commander WALKER. Three good ones and one that we call a hack. The hack is the one we take on shore and is not handled so carefully as the others.

General WALKER. When a class comes to you for the second term of the second year, do they have their mathematics so well in hand that you can assume their knowledge for all purposes of your instruction?

Lieutenant-Commander WALKER. I do assume it, I never inquire about it.

General WALKER. You find your students have no trouble doing your work by inferior instruction they may have had previously?

Lieutenant-Commander WALKER. I take their knowledge of the matter for granted. I teach them no mathematics. I find I can take it for granted.

Senator BUTLER. In other words, you find them prepared to take the course you have to give them from their previous instruction?

Lieutenant-Commander WALKER. I have been through the previous course as an instructor, and know exactly what they have been through.

General WALKER. There has been some question as to the methods pursued here in mathematics?

Lieutenant-Commander WALKER. I am a very partial witness to speak of that. I am thoroughly in accord with that department on the subject of its methods of instruction.

The PRESIDENT. A recent act of Congress has changed the minimum and maximum ages for admission to the Academy, from fourteen to eighteen to from fifteen to twenty years. What are your views on this subject? Will this change be beneficial?

Lieutenant-Commander WALKER. I think the change from fourteen to fifteen is beneficial, but I think twenty is too old.

The PRESIDENT. What do you think the maximum age should be?

Lieutenant-Commander WALKER. I consider eighteen is the most preferable, and that nineteen is the extreme age that it is desirable to enter the cadets. When a student enters at twenty and graduates at twenty-six, he would not be a junior lieutenant until forty or forty-one years of age, and that is too old.

General WALKER. Do you consider the two years' course at sea of any advantage?

Lieutenant-Commander WALKER. I consider it of no advantage. The cadets come back better seamen than when they left, but if they were graduated as ensigns from the Academy and sent into service they would know that active work is before them, which would be an incentive. Now, a part of them go to sea knowing that they will not enter the service, and they waste their time, study as little as possible, improve themselves very little, and come back to the Academy simply to pass their examination and get the year's pay, as provided by Congress. It was recommended by the Academic Board last year, that the class be finally graduated at the end of the four years' term and assigned to service, as at West Point. If that were done, the twenty-year limit would not be so bad.

Chief Engineer H. W. FITCH, U. S. Navy, head of department of steam engineering, appeared before the Board.

Senator BUTLER. How long have you been at the Naval Academy?

Chief Engineer FITCH. Since August 9, 1888. The regular term for instruction to cadets began October the 1st.

Dr. MENDENHALL. Do you consider that the department of steam engineering, at the present time, is properly equipped for the work expected of it? If not, what would be desirable to complete that equipment?

Chief Engineer FITCH. The tools and appointments of the machine and boiler shops are ample for present requirements, for practical instruction in these branches. The forges in the blacksmith's shop are portable, with one exception, and fitted with hand-bellows. This shop should be enlarged and a fan blast fitted. The pattern shop should be enlarged and some power-turning lathes added. The present course of practical instruction in the workshops is good and meets all the requirements for the limited time devoted to it. For practical instructions in managing engines in operation, there is a marine engine, with boilers complete, in the steam building. Also the engines of the steamer *Wyoming*, monitor *Passaic*, and tug *Standish*, and engines of fourteen steam-launches. The engines in the steam building were made twenty-five years ago, are obsolete, and not calculated to give correct ideas of modern practice to the cadets. The *Wyoming's*, is thirty years old; the *Standish* and *Passaic's*, twenty-five. The engines of these vessels are antiquated, not in accordance with the instruction given in the text-books.

Dr. MENDENHALL. Have you any appliances for conducting experiments in thermodynamics, the theory of the steam-indicator and dynamics?

Chief Engineer FITCH. There are none for thermo-dynamics and dynamics. The cadets are instructed in the theory and practical use of the indicator.

Dr. MENDENHALL. Where is instruction in thermo-dynamics taught?

Chief Engineer FITCH. To a limited extent, in the department of physics and chemistry.

Dr. MENDENHALL. Are there facilities here for experiments in the comparative power and relative merits of different fuels?

Chief Engineer FITCH. No, sir.

Dr. MENDENHALL. Would it not be desirable if the department were so equipped?

Chief Engineer FITCH. It would, if the limited time assigned to this department would permit such experiments to be carried out satisfactorily.

Representative HERBERT. Where are such tests of fuel made?

Chief Engineer FITCH. I think some have been made in the New York navy-yard.

Representative HERBERT. You have made some tests on the steaming qualities of coal in the Navy, have you not?

Chief Engineer FITCH. I do not recall any special tests now. I believe they have been made at the New York and Washington navy-yards.

General WALKER. Do the Cadets go on board the vessels here and observe the work?

Chief Engineer FITCH. Yes, sir; they are given practical instruction in managing

the engines of the vessels here, and the steam-launches under charge of engineer officers.

Dr. MENDENHALL. Has the course you refer to been in operation up to the present time, or do you refer to a new course?

Chief Engineer FITCH. I refer to the present course.

Senator BUTLER. Does your instruction begin with the fourth class?

Chief Engineer FITCH. No, sir; the second class is the first to receive instructions in steam.

Senator BUTLER. The fourth and third classes have nothing to do with your department?

Chief Engineer FITCH. No, sir.

Dr. MENDENHALL. Does this course include designing engines?

Chief Engineer FITCH. The present course does not. The course to be adopted October 1 will include that branch.

General WALKER. Ought you not to have a new modern engine, with triple expansion? Would not that be desirable?

Chief Engineer FITCH. Yes, very desirable. The importance of having engines of the latest improved construction of the present time, for giving correct ideas to the cadets, can not be overestimated.

Representative HERBERT. You will have a triple expansion engine in the new ship you are to get. How far will it be practicable to use such an engine in instructing the cadets?

Chief Engineer FITCH. Instruction can be given, when the vessel is used for the regular drills in gunnery and seamanship, during the season and when she goes on the summer cruise.

Representative HERBERT. Is it understood that the new practice ship will be used for the summer cruise?

Chief Engineer FITCH. I can not say positively. I presume she will.

Representative HERBERT. Will you need another engine in addition to the one you will get on the new practice ship?

Chief Engineer FITCH. Yes, sir; the engine in the steam building should be replaced by a new engine with all modern improvements. Much of the practical instruction is given during the winter months, when ice or stormy weather might make it impracticable to use the engines of the ship, and, if for any cause the ship was ordered away, the instruction would be suspended. All the conditions of light, space, accessibility of the parts, are much better adapted for instruction in the steam building than in the dark, confined space on board ship.

Dr. MENDENHALL. In taking the new course in engineering proposed at the Academy, what will be omitted from the course of the first class, in order that the specific studies can be undertaken?

Chief Engineer FITCH. Navigation, gunnery, and part of the branches of seamanship.

Dr. MENDENHALL. Can you state what it is proposed to substitute for navigation and gunnery in the proposed separate course in engineering?

Chief Engineer FITCH. More thorough study of marine engines, designing machinery, marine boilers, and fabrication.

Dr. MENDENHALL. To what extent are the studies substituted theoretical and to what extent practical?

Chief Engineer FITCH. All the details of the new course have not been arranged yet. The branches in marine engines and designing will be theoretical in part; marine boilers, theoretical and practical, and fabrication, practical. Drawings of the machinery of the new ships will be used in that course to instruct the class in the best types of modern marine engines.

General WALKER. Do you find the cadets coming to you have a sufficient understanding of mathematics to comprehend the work they have to do?

Chief Engineer FITCH. Yes, sir. Their knowledge meets all the requirements in this department.

Representative HERBERT. How many assistants have you?

Chief Engineer FITCH. There are four now. The new course will require six.

Representative HERBERT. Taking the course as it has existed during the time you have been here, how many hours a day does each cadet in the second class devote to instruction in your department, including recitation and time of study or preparation?

Chief Engineer FITCH. Each cadet has a recitation one hour long four days a week the first term of sixteen weeks, and one recitation a day three days a week the second term of seventeen weeks. Allowing one hour and a half for study for each recitation, the time each day will be two and a half hours. This will make sixty-four hours for recitation and ninety-six hours for study the first term, and fifty-one hours for recitation and seventy-six hours for study the second term; total, one hundred and fifteen hours' recitation and one hundred and seventy-two hours' study for both terms.

Practical work in machine-shop in summer, two hundred and sixteen hours; in winter, forty hours; total, two hundred and fifty-six hours. Running steam-launches and overhauling engines in steam building, fifty-one hours. Total time for all practical exercises, three hundred and seven hours. Summary of all time that is devoted to instruction in steam by each cadet of the second class, five hundred and eighty-five hours. During the first-class year a cadet has sixty-four hours in the machine-shop and twenty-eight hours in other practical exercises, amounting to ninety-two hours. This included with time of second class year makes six hundred and seventy-six hours, the total of all instruction in steam.

Dr. MENDENHALL. Of what does a recitation or exercise consist? Is it devoted to practical work or is it from the text-books?

Chief Engineer FITCH. The recitations are from the text-books. The exercises are all practical, with oral instruction and explanations by the instructors.

Dr. MENDENHALL. Have you any practical work in your department, except during the summer? Have the cadets, in your classes, any regular ship or practical work in the engine room during the winter?

Chief Engineer FITCH. They have practical exercises, operating the machinery of the monitor *Passaic*, *Standish*, *Wyoming*, and steam-launches during the fall and spring months; and during the winter, in the machine-shop and disconnecting and connecting the marine engines in the steam building one and one-half hours daily for twelve weeks. They also operate the marine engine in the steam building one hour and a half daily for twelve days.

Dr. MENDENHALL. Do you think it desirable to spend so short a time in such work? Would it be better to double the time for it?

Chief Engineer FITCH. It would, if the time could be spared from other studies. The course as now laid out, occupies certain periods of time assigned to each department, and if the time in one department was increased the time in other departments would have to be decreased, and the course would have to be revised.

General WALKER. Do I understand you to say that the cadets do not go to the ships until the second year they have been here?

Chief Engineer FITCH. Not until the third year of the course. The second class is the first to receive instruction in steam, at the beginning of their year, which is the third year of the course.

Senator BUTLER. Do you think the course too severe? Should more time be devoted to it? Would that be beneficial to the cadets?

Chief Engineer FITCH. The course is not too severe. If more time were assigned to this department, it would be more beneficial so far as it was directly concerned.

Senator BUTLER. Do you think they have ample time to make themselves proficient in their profession and that the strain is not too great?

Chief Engineer FITCH. The time devoted to this department gives the cadets a fair knowledge of it; which appears to be the aim and object of the course. To be proficient in all the details would require their whole time and attention.

General WALKER. Do you think, that if time were found, it would be useful to have the cadets to work on the ships, so they might be better acquainted with ship work?

Chief Engineer FITCH. I do not think it would be any advantage to the third and fourth classes. I think they are too young.

General WALKER. Do you mean they are too young to have strength to handle tools?

Chief Engineer FITCH. In most cases, I think they are, and the work would be very irksome to them. I think better results would be attained in all the practical work by waiting until they were older.

General WALKER. Is it not harder to interest them the longer it is put off in their education?

Chief Engineer FITCH. I think not. Considering the limited time they have in this department, I think it better to wait until the cadets reach the second-class year.

Chaplain E. K. RAWSON, U. S. Navy, head of the department of English studies, history, and law, appeared before the board.

The PRESIDENT. How long have you been at the Academy?

Chaplain RAWSON. I have been at the Academy three years, though this is my first year in charge of a department.

The PRESIDENT. Who was at the head of the department before your time?

Chaplain RAWSON. Commander Schouler.

The PRESIDENT. Please state what classes are in your department and what text-books you use.

Chaplain RAWSON. Classes of the first and second years, the fourth and third classes, take the course in our department. We use Whitney's Essentials of English Grammar,

Hart's Punctuation, Swinton's Outlines of the World's History, A. S. Hill's Rhetoric, Ayres's Orthoepist,\* Ayres's Verbalist,\* Eliot's History of the United States, Abbott and Seely's English Lessons for English People, Abbott's How to Write Clearly, Andrew's Manual of the Constitution, and Shakespeare's Julius Cæsar, Rolfe's edition. We use in addition Labberton's Historical Atlas, Mitchell's Atlas,\* the School Herald, Martin's Statesman's Year Book,\* and Webster's Dictionary.

The PRESIDENT. Do you personally give instruction?

Chaplain RAWSON. I have delivered one or two lectures in connection with the study of English literature, but have done nothing more in the way of instruction, thinking it better to get thoroughly familiar with the working of the department before attempting instruction.

Senator BUTLER. How many assistants have you?

Chaplain RAWSON. Five.

Senator BUTLER. What is the scope of the study for the cadets in constitutional law?

Chaplain RAWSON. We use Andrew's Manual of the Constitution. The different articles of the Constitution we explain and comment on. It is a very excellent book and I think we do pretty good work with it, as the examination papers would doubtless show.

Senator BUTLER. You have no law book?

Chaplain RAWSON. No, international law was given up last year, in deference to the want of time in other departments. It was given up also under the supposition that it was not used until the men reached the rank of lieutenant commander, which would give them time to study it up afterwards. But the idea of the department is to give some lessons in international law, so that the students may get a general scope of the study and become familiar with the principal writers, in order to guide them in a study of it for themselves. It was given up, I think, because other departments needed more time.

The PRESIDENT. Are your lectures printed and distributed?

Chaplain RAWSON. No, I have not got so far as that yet. I have only written one or two, but I have signified in them what I wanted the class to study particularly.

Senator BUTLER. To what extent has the course in physiology and hygiene displaced the study of international law?

Chaplain RAWSON. I think hardly any, because it comes in the first-class year.

Representative HERBERT. How much time does a class devote to English literature?

Chaplain RAWSON. Only one recitation a week for the last term. I would say, that I have a scheme for the organization of the department, which has been before the Academic Board, though it has not been acted upon by the board. One change is to put back American history on the preparatory course, for the reason that the students who come here are very well informed in that branch. Of a class examined a few weeks ago, of fifty-six, only four failed in American history. Their knowledge is very thorough. This change was recommended by a board of visitors twenty-two years ago. My intention is to put English history in its place.

Representative HERBERT. Do you think the study of rhetoric is more important to the naval officer than international law?

Chaplain RAWSON. I should say yes. That is, during his academic course.

Representative HERBERT. You devote two lessons a week for four months to rhetoric?

Chaplain RAWSON. Yes, sir.

The PRESIDENT. You graduated at what college?

Chaplain RAWSON. At the Albany Academy and Yale University, class of '68; also Andover Theological Seminary.

Professor ROOT. In your proposed scheme do you make any room for American literature?

Chaplain RAWSON. I have not made any room for it so far.

Professor ROOT. Does it seem probable that you can find time to give these officers, who are to represent the American Government, a knowledge of the literature of their own country?

Chaplain RAWSON. I should touch upon American literature, though less tant.

Professor ROOT. I should be very loath to see it left out of the course for even very young students.

Representative HERBERT. How much time is devoted to the study of the Constitution of the United States?

Chaplain RAWSON. We give it two lessons a week for three months.

Representative HERBERT. During what year is that given?

Chaplain RAWSON. That is in the third class year.

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\* Books marked thus\* used for reference only.

Senator TELLER. How long are these lessons?

Chaplain RAWSON. One period each; that is, one hour.

Senator TELLER. Then you give them twenty-four hours. I know some people who get along without that much, but it looks a little small from the importance of the subject.

*Number of candidates examined, admitted, and rejected in the following years:*

Years.	Candi- dates.	Admit- ted.	Re- jected.	Gradu- at d.	Years.	Candi- dates.	Admit- ted.	Re- jected.	Gradu- ated.
1869	123	87	36		1879	66	41	25	45
1870	153	100	53		1880	66	42	24	60
1871	97	70	27		1881	86	59	47	59
1872	150	91	59		1882	113	57	55	28
1873	190	94	96	28	1883	211	115	96	26
1874	183	88	95	47	1884	161	93	68	24
1875	187	87	100	29	1885	166	81	85	19
1876	188	93	95	34	1886	163	86	77	25
1877	142	80	62	44	1887	165	96	69	44
1878	59	41	18	52	1888	140	89	51	35

MEMORANDA SUBMITTED TO THE BOARD OF VISITORS TO THE NAVAL ACADEMY,  
BY CAPT. W. T. SAMPSON, SUPERINTENDENT.

U. S. NAVAL ACADEMY,  
Annapolis, Md., June 3, 1889.

I think that the most important matter for the consideration of the Board of Visitors is the recent act to regulate the course at the Naval Academy.

The objections to this act are two in number. First in importance is the provision that the age of admission shall be between fifteen and twenty.

The inclosed letter, addressed to the honorable Secretary of the Navy at the time this bill was under consideration, expresses my views upon this question of age:

U. S. NAVAL ACADEMY,  
Annapolis, Md., October 5, 1888.

SIR: I respectfully ask your attention to bill H. R. 9674, which passed the House September 25.

The last clause of section 1 provides that after next March the maximum age of admission to the Academy shall be twenty-one years.

I think this is advancing the age far too much. Undoubtedly the reason for the proposed change is to secure young men of more mature years, who will be more capable of mastering the course of study. I think a little consideration will show that, so far as passing the entrance examination is concerned, the change would not improve matters.

The mental requirements for admission are very simple, and every boy in the country who has had ordinary advantages, has passed the point in his education where he studies the subjects required at admission here. It does not follow, however, that he can pass the examination, because it is found that many boys "finish" arithmetic, geography, grammar and spelling, and are woefully deficient in them all. Nor would they be any better at twenty-one or twenty-five even.

In the natural course of things they would not go back to these rudiments. Candidates are constantly heard to say that they have not studied these things for several years; they had been studying more advanced mathematics, Latin, Greek, etc.

Again, if a young man of twenty or twenty-one has been able to pursue his studies up to the time he is appointed he is far in advance, at least in the branches he studies, if not in actual acquirements, than is required to pass the entering examination.

If he has had such continuous schooling and is not thus advanced, then he is not fit for the service, and never would be. On the other hand, if a young man has reached the age of twenty or twenty-one, and from lack of means, or other cause, has not been at school for three or four years, he is not as well prepared to enter as he was four years previous.

These two classes of young men—those who have had good advantages and those who have had none—may be widely separated in their mental acquirements at twenty years of age; they could not be associated in their subsequent education. The entering examination could not be adjusted to the more favored boys without injustice to those who had had little or no schooling for years.

These two classes, however, are not very different in their acquirements at the age



of fifteen or sixteen years. Most boys are able to attend school till that age, and all should be able to pass the required examination, and, as stated above, if they are not prepared at sixteen, they probably would not be at twenty. Again, the records of this institution show that a larger per centage graduate of those who enter under fifteen, than of those who enter over seventeen. The explanation of this is to be found in the fact that the boy under fifteen who can pass the entering examination has improved his opportunities and possesses a good degree of intelligence; whereas, the boy over seventeen may be able to pass the examination though possessed of much less natural ability and without having made such good use of his opportunities. The consequence is that the younger boy has a better natural and equally good acquired preparation for the four-years course.

The average of admission at present is between sixteen and seventeen, and nearer the latter age. If the age of admission is to be advanced then the requirements should also be advanced, and, consequently, the whole course further developed.

Considering that few enter below fifteen, and that the upper limit is reached by a much larger number, I think it advisable to fix the limits at fifteen and eighteen.

I consider it a serious objection to a plan that it requires the association of boys in the same class and requires the same degree of proficiency of them, when their ages differ so much as five years, which would be the case under the operation of the proposed bill.

The advanced age at which graduates would receive their first commission is a consideration which is of considerable importance, if the age of admission is advanced as proposed. A cadet when promoted would be from twenty-two to twenty-seven years of age, whereas an officer at the age of twenty-seven should have the experience and be capable of taking the responsibility belonging to a lieutenant.

Advancement in the lower grades is already too slow, and this bill would defer it two and a half years on the average, or, in special cases, three years later than is now possible.

The Academic Board, therefore, respectfully recommends that you will request the Senate committee to amend the bill so that the limits shall be fifteen and eighteen years.

Very respectfully,

W. T. SAMPSON,  
*Commander, U. S. Navy, Superintendent.*

The SECRETARY OF THE NAVY,  
*Washington, D. C.*

The second objection to the act is that it continues the six-years course of instruction. The general views of the Academic Board on this subject are expressed in the printed slips herewith:

"The course of study at the Naval Academy was increased from four to six years, chiefly for the purpose of reducing the number of appointments to the Navy. This reason for a course of six years' duration no longer exists, since the number of appointments is now restricted by law to the aggregate number of vacancies occurring in each year in the corps to which appointments are made, the appointments of graduates being not less than ten annually.

"The return of each class to the Academy for the final examination costs the country annually the estimated sum of \$12,000. So far as those cadets who are honorably discharged are concerned, the two-years course at sea is without value to the Government, though entailing considerable expense annually for their pay and rations, estimated at \$32,000; while the persons so discharged virtually waste two years, during which they might acquire some place in civil life.

"The final examination is unnecessary as a method of compelling those cadets who are to be appointed to the Navy to keep up their studies of professional subjects. The naval service requires life-long and continuous study on the part of its officers, and their advancement towards the higher grades is guarded by examinations at every step. No other professional corps and no other body of men in the world, except the *litterati* of China, is required to pass so many examinations. And the final examination of cadets is now similar in character to that which ensigns must pass before promotion.

"From these considerations the board has arrived at the conclusion that the two-years course at sea of naval cadets should be abolished.

"The board believes that the country obtains at the end of the four-years course all the advantages which now accrue from that of six years. The average age of cadets at the end of the four-years course is about twenty-one years. Those who return to civil life at that time can enter upon any work which they may find with minds and bodies trained to systematic and methodical reflection and labor. Nor can it be doubted that they acquire such knowledge of the naval profession and such interest in its duties as will suffice to secure their return to the Navy in case of war. And it is the well-considered opinion of this board, that those who are selected for ap-

pointment to the Navy are fitted to begin, at the end of the four-years course, their work in the Navy, and should be commissioned at that time in the lowest grades of the corps to which they shall be appointed.

"The board believes that the number of graduates of the Academy may be increased advantageously to the country by abolition of the six-years course. The necessary age of candidates now falls between fourteen and eighteen years, while the appointments recur, by districts, once in six years only. It follows, therefore, that, in those districts whose candidates finally graduate, one-third of the boys are never eligible for admission to the Naval Academy. The reduction of the course from six years to four would give each Congressional district the appointment of a cadet once in four years instead of once in six years, and all boys of the country will be eligible at some time. The cadets at the Academy would be increased by the number now serving at sea; that is, the total number of naval cadets would remain the same, but, as the pay of naval cadets at sea is greater than that of cadets at the Academy, the proposed course would be, in this respect, more economical than the existing one. And, while the number of cadets in any year will remain as at present, the number of graduates will be somewhat increased."

"The board concludes that the proposed reduction of course from six to four years will be advantageous to the country and the Navy, and it has sought, therefore, to ascertain the changes in existing laws which would effect the modification of the course in this respect and the selection of cadets for the several naval corps at the end of the third year or at the beginning of the first-class course of study. For this purpose the following scheme of law is submitted:

"Amend the existing law (act of Aug. 5, 1882) so that it shall read as follows:

"The course of study of naval cadets is hereby changed from six years to four years at the Naval Academy; and the Academic Board of the Naval Academy shall, on or before the 30th day of September in each year, separate the first class of naval cadets into two divisions in the proportion which the aggregate number of vacancies occurring in the preceding fiscal year, ending on the 30th day of June, in the lowest grades of commissioned officers of the line corps of the Navy and Marine Corps, shall bear to the number of vacancies occurring during the same period in the lowest grade of commissioned officers of the Engineer Corps of the Navy; and the cadets so assigned to the *first division* of the first class shall thereafter pursue a course of study arranged to fit them for service in the line corps of the Navy, and the cadets so assigned to the *second division* of the first class shall thereafter pursue a separate course of study arranged to fit them for service in the Engineer Corps of the Navy, and the cadets shall thereafter and until graduation take rank by merit with those in the same division according to the merit marks of the four-years course; and the two divisions of the first class shall be graduated at the end of the four-years course; and from the graduates of the *first division* appointments shall be made hereafter as it shall be necessary to fill vacancies in the lowest grades of commissioned officers of the line corps of the Navy and Marine Corps, and the vacancies in the lowest grade of the commissioned officers of the Engineer Corps of the Navy shall be filled in like manner by appointments from the graduates of the *second division*: *Provided*, That no greater number of appointments into the said lowest grades of commissioned officers shall be made each year than shall equal the number of vacancies which shall have occurred in the same grades during the preceding fiscal year, such appointments to be made from the graduates of the year at the conclusion of their four-years course in the order of merit as determined by the Academic Board of the Naval Academy; the assignment to the various corps to be made by the Secretary of the Navy upon the recommendation of the Academic Board; but nothing herein contained shall reduce the number of appointments from such grades below ten in each year, of which three shall be appointed to the Engineer Corps: *Provided further*, That from the class which graduated at the end of four years in June, 1885, there shall be appointed in like manner, but after a final graduating examination, upon the recommendation of the Academic Board, as many as shall equal the total number of vacancies in the lowest grades of commissioned officers of the several corps occurring in the year ending June 30, 1887, and that from the class which graduates at the end of the four-years course in June, 1886, there shall be appointed in like manner, but after a final graduating examination, as at the end of the present six-years course, upon the recommendation of the Academic Board, as many as shall equal the total number of vacancies in the lowest grades of the commissioned officers of the several corps occurring in the year ending June 30, 1887; and if there be a surplus of graduates in any year, those who do not receive such appointments to the said lowest grades of the Navy and Marine Corps shall be given a certificate of graduation and an honorable discharge, and those cadets who shall be honorably discharged from and out of the classes which completed the four-years course in the years 1885 and 1886 shall be given one year's sea pay, as now provided by law for naval cadets so discharged after the six-years course, and the said one year's pay shall not be given hereafter to other grad-

uates of the four-years course; and if the number of vacancies in the lowest grades aforesaid, occurring in any year, shall be greater than the number of graduates of that year, the surplus vacancies shall be filled from the graduates of following years, as they shall become available and all parts of laws inconsistent with the provisions herein contained are hereby repealed, and this act shall take effect on the 30th day of June, 1887."

An apparent effect of the proposed law would be an increase in the lowest grades of the several corps to which appointments are made.

The next matter to which I respectfully ask the attention of the Board is the application of the law in the cases of candidates who are rejected by the Academic Board and of cadets who are subsequently found deficient and recommended to be dropped from the Academy.

It is particularly recommended that the physical examination and rejection be placed upon the same basis as the academic examination and rejection.

The law seems to apply equally to both, but it has been the custom to waive physical defects, and permit rejected candidates to enter the Academy and to continue cadets at the Academy who have been found physically disqualified.

If the law regarding the age of admission were changed as above recommended, the course reduced to four years, and the existing laws enforced, the academic course would be vastly improved.

W. T. SAMPSON,  
*Captain, U. S. Navy, Superintendent.*

## NO. 9.—BUREAU OF YARDS AND DOCKS.

BUREAU OF YARDS AND DOCKS,  
NAVY DEPARTMENT,  
*Washington, D. C., October 14, 1889.*

SIR: I have the honor to submit the following report of the operations of this Bureau for the fiscal year ending June 30, 1889.

The tabulated statements at the end of this report show in detail the amount of expenditures during the last fiscal year, and the estimates for the next fiscal year, under the several heads of improvements, repairs, and preservation, general maintenance, civil establishments, contingent, and support of the naval home.

The total estimates from the different navy-yards and stations are as follows:

Yard improvements .....	\$3,760,716.80
Repairs and preservation .....	980,168.96
General maintenance .....	376,425.72
Civil establishment .....	72,192.95
Naval home .....	82,700.00
<b>Total .....</b>	<b>5,281,204.43</b>

The estimates of the Bureau differ somewhat from those submitted by the several commandants, and are summarized in the following table:

Yard improvements .....	\$958,755.00
Repairs and preservation .....	350,000.00
General maintenance .....	300,000.00
Contingent .....	40,000.00
Civil establishment .....	65,381.32
Naval home .....	82,700.00
Support of Bureau of Yards and Docks .....	11,430.00
<b>Total .....</b>	<b>1,808,266.32</b>

The appropriations for the past year were expended judiciously and economically. The very small appropriations for the present year leave the Bureau in an extremely embarrassing position. The general condition of the buildings, wharves, and other Government property is lamentable, and Congress should make sufficient appropriations to arrest the decay and deterioration. The amounts for maintenance and for repairs must be largely increased, or the Bureau can not meet the absolutely necessary calls upon it from the several yards and stations.

In the matter of improvements this Bureau only recommends what it considers in its best judgment to be for the public interests, and the

wisdom of Congress determines if they are necessary; but regarding the preservation of the Government property in its charge, the Bureau feels that it is its imperative duty to ask for sufficient appropriations. I therefore urgently request that Congress will allow the full amounts estimated for under the heads of "General maintenance" and "Repairs and preservation."

True economy and sound administration require that our present buildings, wharves, sea-walls, sewerage, and water systems, and all other valuable improvements at the navy-yards and naval stations should be put in a good state of repair, and then sufficient appropriations should be made thereafter to keep them so.

My estimate for "repairs and preservation" for the next fiscal year is \$350,000, and for "general maintenance" \$300,000, and I beg that they will not be decreased.

For "contingent" I ask \$40,000. There are always possibilities of sudden and great emergencies arising where so much valuable property is concerned, and the amount estimated for might at such a time save far greater expense if the remedy could be promptly undertaken.

The details regarding expenditures and estimates for improvements at the navy-yards and stations are mentioned under the headings of the several localities.

#### NAVY-YARD, PORTSMOUTH, N. H.

Increasing water supply .....	
Completing hydrant system .....	u

I respectfully renew the recommendation made by my pre-  
last year, and strongly urged with cogent reasons by the pre-  
mandant, that the above estimates for increased water supply  
pleting the hydrant system be allowed. When these improv-  
have been made all the buildings of the yard will have  
supply of water and much better protection against fire.

#### NAVY-YARD, BOSTON, MASS.

Repairing timber wharf No. 1 .....	i
New boilers and pumping machinery, taking down and resetting the end of the granite dry-dock and putting in the necessary backing and drainage ..	
Electric-light plant .....	247
Pair of steel shears .....	8
Remodeling of building No. 32, for offices of commandant, captain of the yard, and other officers .....	7

The repairs to wharf No. 2 were completed during the y-  
of the other wharves are in a very bad condition. All the c f  
yard is landed on timber wharf No. 1, and it should be repa i .

The boilers of the dry-dock have been condemned and two  
ones are now in use. The pumping machinery is liable to give  
any time, and the entire pumping plant should be renewed.

The end of the dry-dock is cracking again and a portion of  
be taken down and reset securely, with proper backing a l a  
The new navy is composed of steel ships, and frequent do  
cessity if the vessels are to be kept in an efficient condi  
docks should, therefore, be always in a good state of r r.

The gas plant at this yard is in a very bad condition i l it  
require a large sum to put it in order. I respectfully re  
introduction of electricity.

A small pair of steel shears are necessary for loading  
heavy weights, as the two pairs formerly in use have be  
and taken down.

The old, unsightly, and unhealthy wooden building, now used as offices for the commandant and captain of the yard, is in need of extensive repairs. It is suggested that the adjoining building, No. 32, be enlarged and remodeled for offices.

A contract was entered into September 18, 1889, for rebuilding officers' quarters, L, M, N, and O, under a special appropriation made by the last Congress.

#### NAVY-YARD, BROOKLYN, N. Y.

Extending railroad system, and purchase of necessary rolling stock .....	\$15,000
Completing approaches to timber dry-dock.....	30,000
Extending brick wall around navy-yard .....	50,000
Improvement of Whitney Basin .....	25,000
Repairing cob dock, and rebuilding sea-wall .....	100,000
Relaying the water pipes in yard. ....	20,000
Dredging .....	20,000
Increasing electric-light plant.....	24,000

In order to proceed intelligently in the development of the capabilities of this yard, the Department has organized a board of officers, to report a plan of permanent improvement, so that any money appropriated by Congress may be expended in carrying out a thoroughly well-digested project in a continuous and economical manner. Very large sums of money have heretofore been expended in disconnected and disjointed works of a temporary character, intended to arrest deterioration and decay, while the same aggregate amount would have completed permanent structures had a systematic plan of improvement been followed. The sea-walls are a notable instance in point. As the report of this Board will be completed in time to lay before the two houses of Congress, I will reserve any remarks upon the general improvement of this yard until it is submitted to the Bureau.

The sum of \$15,000 was appropriated at the last session of Congress for laying a railroad track. It will be expended in connecting the wharves and the principal shops in order to facilitate as much as possible the ship-building work of the yard. This amount is, however, entirely inadequate, and a further sum of \$15,000 is estimated for in order that means of rapid communication may be established.

The Simpson timber dry-dock will not be completed before December 1, the contractors having been greatly delayed and much extra work occasioned by the discovery of a stratum of quicksand. An appropriation is requested to complete the approaches to this dock in a substantial manner.

It is very necessary to extend a wall around the eastern part of the navy-yard to prevent encroachments.

Congress appropriated \$40,000 at its last session for the improvement of Whitney Basin, and this amount is being expended, under the advice of the Board of Permanent Improvement, in building a quay wall along one side of it. This work should be continued.

All of the crib-work of the cob dock, which has not been replaced during recent years, is in a very bad condition and can not be longer neglected. An appropriation is urgently requested for necessary repairs to the dock, and for replacing a portion of the crib-work by a permanent sea-wall.

The water pipes of the yard are reported to be in a very bad condition, and that it is necessary to relay them.

The channel in front of the dry-docks has filled up to such an extent that a large amount of dredging is absolutely required in order to enable vessels to reach the docks.

An appropriation of \$15,000 was made at the last session of Congress for an electric-light plant. As boilers will have to be purchased in order to give the steam pressure required, a further appropriation of at least \$24,000 is necessary to extend the electric lighting to the offices, shops, and dwelling-houses.

Work on the boiler-shop wing of building No. 28 has been continued, and is now being as rapidly pressed as possible.

Progress on the reconstruction of building No. 7 is well advanced, and a contract has been let for the erection of a house for the civil engineer at this yard.

#### NAVY-YARD, LEAGUE ISLAND, PENNSYLVANIA.

Extending permanent sea-wall .....	\$50,000
Building permanent wharf at Fifteenth street.....	56,925
Rebuilding Broad street wharf .....	94,400
Building and furnishing one officers' quarters .....	10,000
Constructing 2,000 feet of light retaining-wall along water front of unused portion of the island .....	25,000
Dredging and filling in .....	50,000
Paving and improvement of grounds.....	14,500

Work on the Simpson timber dry-dock is progressing favorably.

Specifications have been prepared for a permanent sea-wall, and a section of it will soon be contracted for under an appropriation of \$75,000 made by Congress in 1888. It is very necessary that a permanent wall be erected along the water front of the working part of this yard.

At its last session Congress appropriated \$26,475.40 for a landing wharf at the foot of Fifteenth street, to be 75 feet wide and 400 feet long. The estimated cost of a permanent wharf of this size is \$83,400, and an appropriation for the difference is requested. Broad street wharf is in a very bad condition, and should be entirely rebuilt. The wharf facilities estimated for are very essential if this yard is to be again opened.

The bureau is now paying \$2,800 annually for the rent of officers' quarters in the city of Philadelphia. The officers attached to this yard should reside within its limits, as emergencies might arise requiring their presence. I, therefore, urgently recommend that dwelling-houses be erected.

It is probable that one or more railroads will build branches to the entrance of this yard during the present year. An appropriation should be made for the construction of a railroad system on the Government property, connecting with these outside systems. It will greatly facilitate the handling of all freight, and give workmen residing in the city quick and cheap transportation to and from their homes.

The present dikes around the unused part of League Island require constant repairs. A light retaining-wall can be built of a permanent character at a comparatively small expense, and would be in the direction of true economy.

The usual appropriation for dredging and filling in should be continued.

An appropriation for improvement of the grounds and for extending the present pavements should be made.

As steel vessels are now being built at two of our navy-yards, and it may be presumed that Congress will continue this policy, the great advantages of League Island for this purpose should not be overlooked. Situated in the heart of the steel ship-building industry, where the best materials and workmen can be obtained without difficulty, and any per-

manent plant, or vessels upon the ways, are perfectly secure from any possibility of destruction by an enemy during a war with a foreign power, it would seem that its location is unexcelled. The fact, also, that it is surrounded by fresh water, so essential for the preservation of unsheathed steel vessels, and in which timber structures are not attacked by the destructive teredo, are unanswerable arguments in its favor.

A board of naval officers has been constituted by the Department to submit plans and specifications for the permanent improvement of this yard. This report will be completed in time to lay before Congress at its next session, and will contain full information regarding the advantages and possibilities of League Island as a naval station.

#### NAVY-YARD, WASHINGTON, D. C.

Rebuilding quarters A and B .....	\$12, 000
Changing building No. 7 into an apartment house of three stories for additional quarters .....	10, 000
Changing old paint shop into a dwelling with two apartments .....	6, 000
Dredging and filling in .....	10, 000

Congress appropriated \$15,000 at its last session for a railroad system to connect with the Baltimore and Potomac. This has been built, and has greatly facilitated the delivery of the heavy forgings and other materials used at the yard.

A contract has been made, and will be completed the present year, for an electric plant, which will light all the streets and gun-shops.

Many of the officers on duty in this yard have to reside at a considerable distance (they are mostly junior officers with small salaries), in a city where living is very expensive. As a mere matter of justice, Congress should grant the small appropriations asked for to furnish them with quarters.

An appropriation should also be made for dredging the channel to the river.

#### NAVY-YARD, NORFOLK, VA.

Extending permanent sea-wall .....	\$25, 000
Completing railroad system .....	5, 000
Completing water system .....	5, 000
Extending wharf at St. Helena .....	20, 000
Completing approaches to timber dry-dock .....	10, 000
Connecting new pumps with old dry-dock .....	15, 000
Increasing electric-light plant .....	15, 000
Extending machine-shop (steam engineering) .....	5, 000

The permanent quay wall should be gradually extended along the front of this yard, as all timber structures in these waters, unless protected, are rapidly destroyed by the teredo.

A small appropriation will complete both the railroad and water systems, and should be made.

The extension of the wharf at St. Helena is recommended, as it would not only increase the facilities there, but enable the removal of the receiving ship from her moorings in the middle of the stream.

A small appropriation is necessary to complete the approaches to the new dry-dock. This dry-dock has recently been completed and accepted by the Government. It is a splendid structure, and reflects great credit on its builders, Messrs. J. E. Simpson & Co. Notwithstanding its great capacity, it was emptied in one hour and five minutes at the official trial. It is proposed to connect these very powerful pumps with the old granite dry-dock, and an appropriation is urged for that purpose. It now takes eight hours to discharge the water from the granite dock.



It is poor economy to have both gas and electricity in the same yard and an appropriation is urged for an incandescent installation to light the officers' quarters, marine barracks, etc.

In order to increase the facilities of the Bureau of Steam Engineering, an appropriation is requested for the extension of the present machine-shop.

#### NAVY-YARD, PENSACOLA, FLA.

Congress having provided for a commission to report upon the best site for a navy-yard upon the Gulf or South Atlantic coast no appropriation is asked for improvements at this yard.

#### NAVY-YARD, MARE ISLAND, CAL.

Completing repairs to sectional dry-dock .....	\$15,000
Bridge across sectional dock basin .....	2,000
Boat landings .....	3,000
Sinking artesian well (as much as may be necessary) .....	20,000
Building wagon road towards cemetery, magazines, etc .....	5,000
Replanking wharves .....	5,000
Completing electric-light plant .....	30,000
Moving ferry slip back and straightening sea-wall .....	20,000
Dredging .....	10,000
Gate and guard house .....	10,000

An appropriation is asked for to put the sectional dry-dock in good condition. There is a necessity for landings for small boats belonging to men-of-war, and the workmen who reside in Vallejo.

Notwithstanding former unsuccessful attempts, an artesian well should be sunk near the boiler-house, where the steam can be utilized in working the boring tools. The supply of water at this yard costs the Bureau \$6,000 per year, and the breaking of the water main leading from Vallejo would cause the cessation of work in the shops for some time. A water supply on the island is very necessary. It is believed that water can be found by sinking a well of sufficient depth.

The wagon road leading to the cemetery, magazine, light-house, etc. is frequently almost impassable in the rainy season. As there is plenty of good stone on the island, this road should be improved.

The wharves in rear of the sea-wall are represented to be in very bad condition and need replanking.

An appropriation of \$15,000 has already been made by Congress for the introduction of electricity at this yard. This amount should be increased sufficiently to furnish an installation large enough to entirely dispense with the use of gas. The sum of \$16,864.09 was estimated for in the annual report of the commandant to remove the gas hold from its present very dangerous situation to a place of security. It is located in the court of the smithery shops, and is surrounded by open forges, smoke-stacks, etc. An explosion would probably destroy the adjacent buildings, and, during working hours, occasion great loss of life. The Bureau believes it would be much more economical to dispense with gas and furnish a complete electric plant.

The ferry slip should be moved inland and the present rotten wharf removed in order to straighten the water front and prevent deposits and the interruption of the tidal currents.

A small appropriation is absolutely required for dredging. Mud has been deposited along the quay wall to such an extent that no deep draught vessels can lay alongside of it. It was recently necessary to dredge for several days in front of the dry-dock before the French man-of-war *Duquesne* could be admitted.

A gate and guard house is greatly needed at the entrance to the yard. There is no proper protection for the guard now and the gate-house is stated to be in such a dilapidated condition as to be a disgrace to the country.

#### NAVAL STATION, NEW LONDON, CONN.

Building coal shed .....	\$500
Rebuilding wharf.....	6,500

The coal at this station is unprotected from the weather.

The wharf is in a bad condition and should be overhauled at once.

#### NAVAL STATION, PORT ROYAL, S. C.

The house appropriated for by Congress at its last session is being built. No estimate for improvements is submitted.

#### NAVAL STATION, KEY WEST, FLA.

Changing location of railroad tracks, scale-house and pump-house, made necessary by new Treasury buildings..... \$1,000

An appropriation was made the present year of \$8,000 for two officers' quarters. Plans and specifications have been prepared, and a contract for their construction will be made at an early day.

An adjustable stern dock is being built for this station, and will be completed within a few months.

The purchase of the Mallory lot would seem very desirable. It is increasing in value, and the Government may some day have to pay a much larger price.

#### NAVAL HOME, PHILADELPHIA, PA.

The following table shows the changes among the beneficiaries during the last fiscal year:

On our rolls July 1, 1888 .....	197
Original admissions.....	18
Re-admissions .....	6
	<hr/> 221
Died.....	10
Dropped, absent, and unaccounted for.....	5
Dismissed .....	4
Transferred to Government Insane Asylum .....	2
Discharged at own request.....	5
	<hr/> 26
Total on rolls July 1, 1889.....	<hr/> 195
Total expenditures at this institution during the fiscal year .....	\$77,900
Total estimate for the fiscal year ending June 30, 1891.....	82,700

A table is appended to this report showing the details of expenditures and estimates.

Capt. Edward E. Potter, U. S. Navy, governor of this institution, reports that "the buildings and grounds of the Home have been kept in an excellent condition of repair and preservation, and, as far as funds were available, improvements were made, making the place a comfortable and beautiful home for the old and decrepit of the Navy."

The brick building for kitchen, laundry, and dormitories for female employes is nearing completion, and will relieve the crowding and

greatly add to the comfort of the beneficiaries. This annex will necessitate the addition of two laborers to attend to the furnaces, lights, halls, etc., and they are included in the estimates. The necessity of permanent painters and carpenters where there are so many buildings to look after is very great, and they should be included in the annual appropriation.

I repeat the recommendations, made for years past, for an increase in the pay of certain employés, whose services deserve the amount of compensation asked. Suitable cooks can not be obtained for less wages than the estimates, and the Bureau is solicitous that this matter, which so directly affects the comfort and contentment of the beneficiaries, shall meet with favorable consideration.

The hydraulic elevator asked for is an imperative necessity, in the opinion of the Bureau. The majority of the inmates are old and infirm, and as the dining-room is in the basement, several laborious and painful trips have to be made daily up and down the steep stairways. The small expense of this elevator, when compared with the humane and beneficial results, should lead to its construction at the earliest possible date.

The money appropriated for the fiscal year ending June 30, 1889, for "fitting up bath-rooms for beneficiaries, \$800," could not be made available, as these bath-rooms are to be placed in the annex building not yet completed. I therefore recommend that this amount be re-appropriated for this purpose.

Some of the estimates are probably larger than may be required, but the number of beneficiaries is fluctuating, and the rules governing their allowances fixed. The appropriation should be sufficient to make sure that the comfort of all the inmates is attained, as the surplus annually lapses into the Treasury. It should be borne in mind that all the expenses of the Home are paid from the income of the naval pension fund, and that these old veterans helped to create it.

I would renew the recommendation that the wharf-lot, situated on the east bank of the Schuylkill River, belonging to the Home, be sold, and the money received for it be placed to the credit of the Home, to be used in the introduction of steam-heat and electric lights in all the buildings.

#### NAVY-YARD COMMISSIONS.

On September 7, 1888, Congress authorized the appointment of two commissions to select the most desirable site for navy-yards, one on or near the coast of the Gulf of Mexico and the South Atlantic coast, and the other north of the forty-second parallel of north latitude in the State of Oregon and Territories of Washington and Alaska.

These commissions have been appointed, and the Bureau anticipates with much interest their reports, and hopes that Congress will take immediate action regarding whatever sites are selected, as navy-yards are essential in the localities designated.

#### NAVAL STATION, PAGO PAGO, SAMOA.

At its last session Congress made an appropriation for the establishment of a permanent coaling station at Pago Pago, Samoa. Under direction of Rear-Admiral Kimberly, U. S. Navy, commanding the Pacific Station, surveys of the harbor and a report regarding the best sites for a coaling station have been made.

## SALARY OF CHIEF CLERK.

The chief clerk of this Bureau has been employed in it since 1857. He has faithfully and efficiently discharged all his duties. There has been no change in the rate of pay for this position since July 1, 1853, while the salaries of men holding like positions in other departments of the Government have been considerably increased. I respectfully recommend, as a matter of justice, that the salary of the chief clerk of this Bureau be fixed at the same rate as is paid for the same service in other departments.

## ASSISTANT TO CHIEF OF THE BUREAU.

The detail of a line officer as assistant to this Bureau is a very necessary one, so that during the absence of the Chief of the Bureau, some one fully acquainted with his views may take his place. As it is important that the services of an officer of the highest ability and professional knowledge be secured for this position, I would respectfully urge upon Congress the wisdom of giving the highest pay of his grade to the officer while serving in this capacity.

Very respectfully, your obedient servant,

G. B. WHITE,  
*Chief of Bureau.*

Hon. B. F. TRACY,  
*Secretary of the Navy.*

No. 1.—*Report of expenditures at navy-yards, stations, and Naval Home for the year ending June 30, 1889.*

Yards and stations.	Appropriations.					Total.
	Yard improvement.	Repairs and preservation.	General maintenance.	Civil establishment.	Contingent.	
Portsmouth, N. H.		\$30,963.54	\$13,268.88	\$5,086.02		\$49,318.44
Boston, Mass.	\$31,255.79	25,219.30	21,820.32	3,812.22	\$1,684.05	83,791.68
New London, Conn.		199.14	3,731.25			3,930.39
Brooklyn, N. Y.	882,456.50	89,932.62	40,615.67	9,248.95		522,253.74
League Island, Pa.	34,974.83	11,369.26	12,414.47	3,189.50		61,948.06
Washington, D. C.	1,000.00	23,162.15	13,073.49	3,141.35		40,376.99
Norfolk, Va.	369,966.32	71,782.30	21,437.99	6,336.30	14,944.00	484,466.91
Pensacola, Fla.		8,363.95	11,175.08	1,800.00		21,339.03
Mare Island, Cal.	101,593.45	46,371.30	30,971.40	12,060.57	2,101.81	193,098.53
Sacket's Harbor, N. Y.		455.55	32.82	365.00		853.87
Key West, Fla.		3,346.26	1,322.12			4,668.38
Naval Home, Pa.	*77,900.00					77,900.00
Wharf at Erie, Pa.					500.00	500.00
Port Royal, S. C.	820.00	1,481.50	403.49			2,704.99
	999,966.89	312,648.87	170,266.98	45,039.91	19,229.86	1,547,150.51

\* This is for the entire support of the Naval Home, is a separate appropriation, and placed under this head for convenience only.

No. 2.—Detailed report from navy-yards and stations of expenditures under "repairs and preservation" during the fiscal year ending June 30, 1890.

Objects.	Portsmouth.	Boston.	New London.	Brooklyn.	League Island.	Washington.	Norfolk.	Pensacola.	Mare Island.	Key West.	Sackett's Harbor.	Port Royal.	Total.
Yard buildings.....	\$5,421.67	\$3,807.43	\$171.75	\$16,878.42	\$2,794.14	\$12,874.98	\$28,017.31	\$2,742.61	\$4,551.82	\$1,769.18	\$455.55	\$75.90	\$80,562.66
Officers' quarters.....	448.60	3,574.77		5,082.57	79.98	3,236.69	1,950.57	1,496.68	2,566.05			500.00	18,943.00
Wharves, bridges, landings, and boats.....	4,098.06												
Roads, walks, gutters, and drains.....				16,754.99	83.72	131.24	14,567.22	1,890.48	1,896.21	1,010.40		896.80	41,279.42
Fences and walls.....	2,022.05	441.86		10,362.62	1,148.17	1,262.59	4,008.71	350.75	2,908.70			25.00	22,528.35
Cranes, saws, and derricks.....	93.89	187.60		2,381.75	6.08	1,230.30	1,731.61	58.66	896.87	566.08			7,153.53
Furnaces, forges, heating apparatus, etc.....	286.45	3,048.00		693.45	80.00	83.88	9,938.74	488.05	741.89				15,361.46
Tracks and scales.....	4,195.23	1,695.01	6.39	1,024.25	75.98	1,153.51	323.19	226.09	8,950.24				17,646.89
Water and gas works.....	3,881.60	505.00		20,963.87	9.00	172.67	143.11						21,793.65
Dredging and scowling.....		829.72		1,597.00	104.41	2,068.60	595.68	19.82	2,736.02				11,862.85
Dry-docks.....	7,163.84	9,444.56		8,545.05		3.16			200.00				8,748.21
Miscellaneous repairs.....	3,346.40	1,685.35	21.00	5,473.27	398.36	934.44	11,573.90	90.81	12,436.39			25.00	24,030.98
Repairs to dikes.....					6,588.42								6,588.42
Board of permanent improvement.....				163.49									163.49
Total.....	30,963.54	25,219.39	199.14	80,832.62	11,369.26	23,163.15	71,782.39	8,368.95	44,871.30	3,346.26	455.55	1,451.50	312,646.87

\* Balance decd.

No. 3.—Detailed report of expenditures under "general maintenance" received from yards and stations during the fiscal year ending June 30, 1889.

Objects.	Porta- month.	Boston.	New London.	Brooklyn.	League Island.	Washing- ton.	Norfolk.	Pensacola.	Mare Island.	Key West.	Sackett's Harbor.	Port Royal.	Total.
Freight and transportation.													\$3,483.82
Printing, stationery and ad- vertising.			\$16.00	\$632.95		\$27.85			\$2,786.92				2,103.77
Books, maps, models, and drawings.		\$322.73		\$45.99	\$257.43	53.02	\$317.55	\$43.68	248.90	\$14.87			34.76
Purchase and repair of fire- engines.	\$0.45	23.26		568.60	31.00		251.03	4.42					864.90
Machinery of every descrip- tion and patent rights.	12.44	14.73		4,298.95	12.19	18.80	3,008.30	56.88					7,414.28
Repairs on steam-engines and attendance on same.			24.00	212.73	4.50	18.09	90.21	12.80	19.44				373.77
Purchase and maintenance of oxen and horses, pay of hired teams, etc.	3,439.99	2,282.06	243.91	8,525.83	3,728.89	3,298.33	4,000.97	1,273.15	7,943.71			\$150.00	34,226.86
Carts, timber-wheels, and tools of every description.	107.42	646.64		2,419.39	597.45	1,249.88	1,235.83	459.34	3.48				6,719.43
Postage on letters on public service and telegrams.	124.00	8.00	6.00	317.13	16.24	6.98			449.21				927.56
Furniture for Government houses and offices in navy- yards.													2,787.15
Coal and other fuel.	60	452.72	2.92	411.88	104.55	1,349.02	332.06	118.42	15.00				11,372.67
Candles, oil and gas.	795.40	2,792.36	59.00	3,867.27	243.49	1,398.29	306.04	74.50	1,600.00		\$32.82	122.50	10,065.48
Cleaning and clearing up yards and care of buildings.	965.83	709.34		3,419.19	47.36	505.66	1,415.75	241.00	2,645.85	7.50		48.00	
Attendance on fires, lights, fire-engines, and apparatus.	291.21	2,998.05	564.17	488.58	150.26	4,498.46	1,743.22	1,058.98	1,082.19				12,875.10
Incidental labor, not charge- able to other appropriations.	1,084.39	1,419.12		3,623.44	2,505.45	111.04	1,154.74	2,118.10	1,121.24				13,137.62
Water tax.	2,768.90	1,375.04	624.00	17.59	164.64	485.24	108.30	117.60	2,152.29				7,987.81
Tolls and ferrage.		4,940.43	1.25	5,034.94			98.75	55.00	5,682.85			22.29	15,943.11
Pay of watchmen.	3,650.00	2,791.04	2,190.00	5,832.72	1,469.00		7,335.24	5,821.83	2,016.60	1,245.00			3,486.73
Flags, awnings, and packing- boxes.	38.25	39.78			50.49	66.33		19.40	72.12				288.87
Rent of landings.													
Rent of officers' quarters, Philadelphia, Pa.													
Total.	13,308.68	21,820.83	3,761.25	40,615.67	13,414.47	13,073.49	31,457.99	11,175.08	30,971.40	1,322.12	82.82	403.49	170,360.96

**No. 4.—Estimates received from navy-yards, stations, and naval home for fiscal year ending June 30, 1891.**

Yards and stations.	Appropriations.				
	Yard improvements.	Repairs and preservation.	General maintenance.	Civil establishment.	Total.
Portsmouth, N. H.	\$88,430.00	\$47,650.00	\$15,068.80	\$5,755.00	\$157,833.80
Boston, Mass.	195,392.97	244,000.00	39,077.40	7,869.00	486,339.37
New London, Conn.		7,820.00	4,107.75		12,927.75
Brooklyn, N. Y.	562,716.32	188,094.95	85,600.00	14,847.25	850,758.52
League Island, Pa.	1,379,190.12	165,458.94	45,842.54	12,426.00	1,602,918.60
Washington, D. C.		72,500.00	22,720.00	5,641.88	100,261.88
Norfolk, Va.	713,520.00	88,218.96	79,070.48	10,909.88	891,719.32
Pensacola, Fla.		87,123.45	21,829.00	2,350.00	111,302.45
Mare Island, Cal.	799,967.39	79,836.16	56,680.00	13,494.44	950,947.99
Sacket's Harbor, N. Y.		1,000.00			1,000.00
Key West, Fla.	20,000.00	6,720.00	3,332.25		30,052.25
Naval Home, Pa.	82,700.00				82,700.00
Port Royal, S. C.	1,500.00	550.00	2,197.50		4,247.50
Total	3,843,416.80	989,168.96	376,425.73	72,192.95	5,281,204.44

**No. 5.—Detailed estimates from yards and stations for works of improvement for the fiscal year ending June 30, 1891.**

Yards, stations, and objects.	Estimates.	Total.
<b>PORTSMOUTH, N. H.</b>		
For cleaning ponds (3)	\$1,500.00	
For proposed reservoir	4,500.00	
For piping	350.00	
For completing hydrant system	6,080.00	
For building plant, including boiler, engine, etc., for construction and repair of iron and steel vessels	79,000.00	
		\$82,430.00
<b>BOSTON, MASS.</b>		
For cart shed	10,662.61	
For paving and grading	43,281.79	
For sheers	7,950.00	
For timber wharf No. 5	25,684.87	
For timber wharf No. 1	15,758.00	
For electric light plant	9,500.00	
For dry-dock	75,000.00	
For remodeling building	7,557.70	
		195,392.97
<b>BROOKLYN, N. Y.</b>		
For completing boiler-shop wing, building No. 28	47,000.00	
For erecting shop	111,107.70	
For blacksmith and cooper shop	46,853.80	
For railroad tracks	83,795.60	
For dredging	25,000.00	
For yard wall	107,857.52	
For roads, walks, gutters, and drains	138,000.00	
		562,716.32
<b>LEAGUE ISLAND, PA.</b>		
For 15th street wharf	83,400.00	
For 16th street wharf	80,500.00	
For protection-wall 206 feet east of Broad street wharf	63,887.60	
For 600 feet timber dry-dock	650,000.00	
For 17th street wharf	66,280.00	
For protection-wall west of 17th street	81,488.75	
For dredging and filling in	75,000.00	
For 1,000 feet light-retaining wall	12,614.00	
For commandant's office building	53,735.59	
For quarters B. and C.	80,582.85	
For quarters D. and E.	80,582.85	
For office of yard paymaster	19,579.29	
For office of yard surgeon	19,579.29	
For seven officers' quarters	141,000.00	
For Belgian pavement	21,000.00	
		1,379,190.12
<b>U. S. NAVAL HOME, PHILADELPHIA, PA.</b>		
For support of beneficiaries, improvements, and all expenses		82,700.00

No. 5—Detailed estimates from yards and stations for works of improvement for the fiscal year ending June 30, 1891—Continued.

Yards, stations, and objects.	Estimates.	Total.
NORFOLK, VA.		
For extension to quay wall .....	\$308,520.00	\$713,520.00
For railroad extension .....	5,000.00	
For deep-water basin .....	300,000.00	
For water system .....	5,000.00	
For wharf at timber dry-dock and approaches .....	60,000.00	
For wharf at St. Helena .....	20,000.00	
For extension and inclosure of erecting shed .....	10,000.00	
For extension of machine shop .....	5,000.00	
MARE ISLAND, CAL.		
For timber shed .....	57,760.30	798,967.89
For rolling mill, Bureau of Steam Engineering .....	40,000.00	
For boat landings .....	5,000.00	
For roads .....	25,000.00	
For gate and gate house .....	20,000.00	
For extension of quay wall .....	155,000.00	
For erection of two 12-ton swinging cranes .....	8,000.00	
For dredging .....	10,000.00	
For Artesian well .....	25,000.00	
For moving ferry-slip inland, etc .....	20,147.00	
For caisson .....	85,000.00	
For gas-holder .....	16,664.09	
For road from stables to light-house .....	5,000.00	
For bridge across sectional dock basin .....	2,696.00	
For mud dredger and scow .....	40,000.00	
For replacing wharf in rear of sea-wall .....	5,200.00	
For widening gauge in railroad tracks .....	6,500.00	
PROPOSED STEEL SHIP-BUILDING PLANT FOR BUREAU OF CONSTRUCTION AND REPAIR.		
For grading .....	20,000.00	798,967.89
For alterations and improvements in the ship-fitter and furnishing shops, including leveling of floors, removal of partition wall and chimney, filling in of cistern, building pattern shops and galleries, laying foundation ready to receive new 250 I. H. P. engine, and building house over engine .....	45,000.00	
For five sheds complete with floors, corrugated iron roof, sky-lights, etc. ....	60,000.00	
For railroad tracks, turn-tables, and rolling stock .....	15,000.00	
For adaptation of dock basin for building ship .....	110,000.00	
For electric light plant .....	5,000.00	
For wharf in front of saw-mill .....	18,000.00	
KEY WEST, FLA.		
For purchase of Mallory lot .....		20,000.00
PORT ROYAL, S. C.		
For fitting and equipping telegraph and telephone line between this station and Port Royal .....		1,500.00
Total improvements .....		3,843,416.80



No. 6.—Detailed estimates from navy-yards and stations for "repairs and preservation" for the fiscal year ending June 30, 1891.

Objects.	Portsmouth. month.	Boston.	New London.	Brooklyn.	League Island.	Washing- ton.	Norfolk.	Pensacola.	Mare Island.	Sackett's Harbor.	Key West.	Port Royal.	Total.
Yard buildings.	\$20,000.00	\$150,000.00	\$750.00	\$94,944.05	\$17,330.30	\$20,000.00	\$47,428.88	\$13,727.91	\$22,620.14	.....	\$1,377.50	\$150.00	\$388,338.66
Officers' quarters.	3,500.00	4,000.00	500.00	4,000.00	1,003.25	4,000.00	3,121.00	9,213.85	5,144.00	.....	.....	50.00	34,662.10
Wharves, bridges, landings, and boats.	1,000.00	16,500.00	6,370.00	19,150.00	106,811.15	2,500.00	3,791.00	26,643.34	3,500.00	.....	3,527.00	100.00	189,912.49
Roads, walks, gutters, and drains.	1,900.00	18,000.00	.....	10,000.00	601.00	6,000.00	9,150.80	1,998.34	8,000.00	.....	.....	50.00	55,700.14
Fences and walls.	5,000.00	6,000.00	250.00	7,000.00	201.50	1,500.00	4,713.65	3,122.00	2,000.00	.....	89.50	50.00	30,013.35
Cranes, saws, and derricks.	500.00	10,000.00	.....	15,500.00	1,025.00	500.00	4,000.00	2,366.24	350.00	.....	.....	50.00	34,191.24
Furnaces, forges, heating ap- paratus, etc.	3,000.00	4,000.00	50.00	1,800.00	558.00	5,000.00	544.05	503.11	1,600.00	.....	.....	50.00	17,103.76
Tracks and scales.	100.00	5,500.00	.....	600.00	1,630.00	3,500.00	3,164.00	830.00	3,000.00	.....	522.50	50.00	20,063.50
Water and gas works.	5,000.00	5,000.00	.....	5,000.00	5,635.00	2,500.00	1,800.00	3,000.00	3,000.00	.....	.....	.....	28,765.00
Dredging and scowling.	.....	10,000.00	.....	25,000.00	.....	25,000.00	3,000.00	15,720.00	.....	.....	.....	.....	78,720.00
Dry-docks.	5,500.00	5,000.00	.....	5,000.00	483.04	.....	2,500.00	10,545.00	*28,222.02	.....	.....	.....	60,017.02
Miscellaneous repairs.	2,000.00	10,000.00	.....	.....	30,000.00	.....	5,000.00	2,453.66	4,500.00	1,000.00	1,204.00	.....	81,643.70
Dikes.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	30,000.00
Total.	47,650.00	244,000.00	7,920.00	188,094.95	165,459.04	72,500.00	83,213.96	87,123.45	79,836.16	1,000.00	6,720.50	550.00	989,165.96

\* Sectional dock.

No. 7.—Detailed estimate for "general maintenance" received from yards and stations for the fiscal year ending June 30, 1901.

Objects.	Porta- month.	Boston.	New London.	Brooklyn.	League Island.	Washing- ton.	Norfolk.	Pennacola.	Mare Island.	Key West.	Port Royal.	Total.
Freight and transportation	\$20.00	\$200.00	\$20.00	\$1,000.00		\$50.00	\$100.00	\$25.00	\$3,000.00			\$4,415.00
Printing, stationery, and advertising	5.00	50.00		500.00		500.00	500.00	210.00	1,000.00	\$10.00	\$50.00	\$3,370.00
Books, maps, models, and drawings		100.00		1,000.00		50.00	1,074.50		100.00			\$2,344.50
Purchase and repair of fire-engines	10.00			3,000.00	\$338.20	500.00	2,859.25	3,287.14	500.00		50.00	10,462.59
Machinery of every description and patent rights	50.00	1,000.00		8,000.00	1,755.00	500.00	4,068.25	458.80	1,500.00			17,333.14
Repairs on steam-engines and attendance on same	75.00	500.00		5,000.00	1,212.20	1,000.00	6,684.11	303.80	6,000.00			20,775.11
Purchase and maintenance of oxen and horses, pay of hired teams, etc.	2,400.00	7,000.00	200.00	10,000.00	9,855.00	5,000.00	14,413.42	2,088.43	10,000.00		150.00	60,802.85
Carts, timber-wheels, and tools of every description	500.00	2,000.00		5,000.00	5,807.70	2,500.00	9,311.28	75.00	700.00		100.00	26,445.64
Postage on letters on public service and telegrams	125.00	50.00	6.00	100.00		20.00	25.00		500.00			820.00
Furniture for Government houses and offices in navy yards	1,000.00	1,500.00		5,000.00	2,380.00	2,500.00	7,000.00	2,114.10	3,000.00	1,500.00	800.00	26,604.10
Coal and other fuel for yards and dock purposes	2,500.00	3,500.00	40.00	6,000.00	3,400.00	2,000.00	1,780.50	241.00	8,000.00		300.00	27,741.50
Candles, oil, and gas	900.00	1,500.00		4,000.00	216.70	1,000.00	2,650.00	358.00	4,000.00	107.50	150.00	14,882.00
Cleaning and clearing up yards and care of buildings	500.00	4,500.00	773.25	15,000.00	4,500.00	5,500.00	5,760.02	1,700.80	5,400.00	250.00	547.50	44,140.66
Attendance on fires, lights, fire-engines, and apparatus	1,000.00	2,500.00		5,000.00	4,500.00	1,000.00	3,676.85	2,462.24	3,000.00			23,139.09
Incidental labor, not chargeable to other appropriations	3,000.00	2,000.00	782.50	2,000.00	4,368.66	500.00	6,000.00	150.80	3,700.00			22,351.18
Water-tax		5,000.00		4,000.00			1,500.00	54.75	5,000.00			15,711.55
Tolls and ferrage	12.00			500.00			50.00	60.00	3,000.00			3,622.00
Pay of watchmen	3,766.80	7,577.40	2,190.00	10,000.00	7,590.00		11,504.80	7,504.40	3,200.00	1,306.00		54,438.40
Flags, awnings, and packing boxes	50.00	100.00		500.00	701.50	100.00	232.50	121.71	250.00	15.00	50.00	2,120.41
Total	15,998.80	39,077.40	4,107.75	85,600.00	45,642.54	22,720.00	79,070.46	21,829.00	56,650.00	3,332.25	2,197.50	376,425.72

*Report showing amount expended during the fiscal year ending June 30, 1889, from appropriations pertaining to the Bureau of Yards and Docks, for civilians employed on clerical duty, or in any other capacity than ordinary mechanics and workmen, at the several navy-yards, and submitting estimates for such civilian employees for the fiscal year 1890 in compliance with the third section of naval appropriation act approved January 31 1885 (for a year of 365 days).*

Navy-yards and rating, and rate of pay.	Amount paid to civilians employed during the fiscal year ending June 30, 1889.	Estimates for civilian employees for the fiscal year ending June 30, 1890.	
		Rate of pay.	Amount.
PORTSMOUTH, N. H.			
Clerk, at \$1,400 per annum.....	\$1,400.00	\$1,400.00	\$1,400.
Mail messenger, at \$600 per annum.....	600.00	600.00	600.
Messenger, at \$600 per annum.....	600.00	600.00	600.
Foreman laborer and head teamster, at \$4 per diem*.....	1,248.00	4.00	1,460.
Janitor, at \$600 per annum.....	143.02	600.00	600.
Pilot, at \$3 per diem*.....	1,095.00	3.00	1,095.
Total.....	8,086.02		8,
BOSTON, MASS.			
Clerk, at \$1,400 per annum.....	1,399.94	1,400.00	1,400.
Foreman laborer, at \$4 per diem.....	714.00	4.00	1,232.
Messenger to commandant, at \$1.76 per diem.....	549.12	1.76	550.
Messenger, at \$1.76 per diem.....	549.12	1.76	550.
Mail messenger, at \$600 per annum.....	600.04	600.00	600.
Writer, at \$1,017.25 per annum (submitted).....		1,017.25	1,017.
Draughtsman, at \$5 per diem (submitted).....		5.00	1,565.
Total.....	3,812.22		6,936.
BROOKLYN, N. Y.			
Clerk, at \$1,400 per annum.....	1,399.94	1,400.00	1,400.
Writer, at \$1,017.25 per annum.....	1,017.22	1,017.25	1,017.
Two writers, at \$1,017.25 each per annum (submitted).....		2,034.50	2,034.
One writer, at \$900 per annum (submitted).....		900.00	900.
Foreman laborer, at \$4.50 per diem.....	1,401.00	4.50	1,401.
Mail messenger, at \$600 per annum.....	553.29	750.00	750.
Messenger to commandant, at \$2.50 per diem*.....	912.50	2.50	912.
Messenger to captain, at \$2.25 per diem.....	701.00	2.25	704.
Draughtsman, at \$5 per diem.....	1,560.00	5.00	1,565.
Superintendent of teams or quartermen, at \$4 per diem.....	1,076.00	4.00	1,532.
Messenger to civil engineer, at \$2 per diem.....	624.00	2.25	700.
Draughtsman to civil engineer in charge of dock, at \$5 per diem.....	115.00		
Draughtsman to board of improvement, at \$5 per diem.....	65.00		
Writer to board of improvement, at \$3.04 per diem.....	36.48		
Two rodmen to board of improvement, at \$2.48 each per diem.....	66.96		
Quartermen, at \$4 per diem (submitted).....		4.00	1,252.
Total.....	9,532.39		13
SACKETT'S HARBOR, N. Y.			
Ship-keeper, at \$1 per diem*.....	365.00	1.00	365.
LEAGUE ISLAND, PA.			
Clerk, at \$1,400 per annum.....	1,392.38	1,400.00	1
Writer, at \$1,017.25 per annum (submitted).....		1,017.25	1.
Messenger, at \$1.76 per diem.....	549.12	2.00	
Foreman laborer, at \$4 per diem.....	1,248.00	4.00	1
Draughtsman, at \$4 per diem.....	128.00		
Draughtsman, at \$5 per diem (submitted).....	285.00	5.00	1
Quartermen, at \$2.50 per diem.....	302.50		
Telegraph operator and type-writer, at \$1,000 per annum (submitted).....		1,000.00	1,000.
Sub-inspector, at \$4 per diem.....	99.00		
Subinspector, at \$3.50 per diem.....	80.50		
Leveler, at \$3.84 per diem (submitted).....	215.04	1,200.00	1
Rodman, at \$2.56 per diem (submitted).....	108.24	800.00	
Total.....	4,447.78		1

\* Including Sundays.

*Report showing amount expended during the fiscal year ended June 30, 1889, etc.—Cont'd.*

Navy-yards and rating, and rate of pay.	Amount paid to civilians employed during the fiscal year ending June 30, 1889.	Estimates for civilian employees for the fiscal year ending June 30, 1891.	
		Rate of pay.	Amount.
WASHINGTON, D. C.			
Clerk, at \$1,400 per annum .....	\$1, 376.99	\$1, 400.00	\$1, 400.00
Messenger, at \$1.76 per diem .....	547.36	2.00	626.00
Foreman laborer, at \$4 per diem .....	1, 217.00	4.00	1, 252.00
Mail messenger, at \$2.50 per diem (submitted)* .....		2.50	912.50
Janitor, at \$2 per diem (submitted) .....		2.00	626.00
Total .....	3, 141.35		4, 816.50
NORFOLK, VA.			
Clerk, at \$1,400 per annum .....	1, 399.93	1, 400.00	1, 400.00
Writer, at \$1,017.25 per annum .....	1, 017.16	1, 017.25	1, 017.25
Writer, at \$1,017.25 per annum (submitted) .....		1, 017.25	1, 017.25
Foreman laborer, at \$4 per diem .....	1, 240.00	1, 252.00	1, 252.00
Mail messenger, at \$2 per diem* .....	730.00	2.00	730.00
Messenger, at \$2 per diem .....	624.00	2.00	626.00
Messenger, at \$2 per diem .....	624.00	2.00	626.00
Pilot, at \$2.26 .....	701.21	2.26	707.38
Draughtsman, at \$5 per diem (submitted) .....	980.49	5.00	1, 565.00
Leveler, at \$4 per diem .....	1, 248.00		
Total .....	8, 564.79		8, 940.88
PENSACOLA, FLA.			
Clerk, at \$1,200 per annum .....	1, 200.00	1, 200.00	1, 200.00
Mail messenger, at \$600 per annum .....	600.00	600.00	600.00
Lamp-lighter, at \$550 per annum (submitted) .....		550.00	550.00
Total .....	1, 800.00		2, 350.00
MARE ISLAND, CAL.			
Clerk, at \$1,400 per annum .....	1, 396.17	1, 400.00	1, 400.00
Writer, at \$1,017.25 per annum .....	1, 017.26	1, 017.25	1, 017.25
Foreman mason, at \$6 per diem .....	1, 812.00	6.00	1, 878.00
Foreman laborer, at \$5.50 per diem .....	1, 705.00	5.50	1, 721.50
Pilot, at \$4.80 per diem .....	1, 497.60	4.80	1, 502.40
Draughtsman, at \$5 per diem .....	1, 560.00	5.00	1, 565.00
Mail messenger, at \$2.74 per diem* .....	994.62	2.74	1, 000.10
Messenger, at \$2.20 per diem .....	686.40	2.20	688.60
Messenger and lamp-lighter, at \$2.20 per diem .....	686.40	2.20	688.60
Bell-ringer, at \$2.26 per diem .....	705.12	2.26	707.38
Janitor, at \$2.20 per diem (submitted) .....		2.20	688.60
Total .....	12, 060.57		12, 857.43
KEY WEST, FLA.			
Messenger, at \$600 per annum .....		600.00	600.00

\* Including Sundays.

*Recapitulation of expenditures for civilian employees for fiscal year ending June 30, 1889, and estimates for the same for fiscal year ending June 30, 1890, per act approved January 30, 1885.*

Navy-yards.	Expenditures, 1888-'89.	Estimates, 1890-'91.
Portsmouth, N. H. ....	\$5, 086.02	\$5, 755.00
Boston, Mass. ....	3, 812.23	6, 936.01
Brooklyn, N. Y. ....	9, 532.39	13, 900.25
Sackett's Harbor, N. Y. ....	365.00	365.00
League Island, Pa. ....	4, 447.78	8, 860.25
Washington, D. C. ....	3, 141.35	4, 816.50
Norfolk, Va. ....	8, 564.79	8, 940.88
Pensacola, Fla. ....	1, 800.00	2, 350.00
Mare Island, Cal. ....	12, 060.57	12, 857.43
Key West, Fla. ....		600.00
Total .....	48, 810.12	65, 381.32

*Statement of the appropriations for the Bureau of Yards and Docks for the fiscal year ending June 30, 1889, showing the amounts expended under each specific head of appropriation, and the balances remaining unexpended June 30, as required by section 429, Revised Statutes.*

Appropriation for general maintenance, 1889.....	\$165,000.00
Expended from July 1, 1888, to June 30, 1889 .....	150,152.84
Balance on hand July 1, 1889 .....	14,847.16
Which will be entirely absorbed.	
Appropriation for repairs and preservation, 1889.....	300,000.00
Expended from July 1, 1888, to June 30, 1889 .....	271,383.13
Balance on hand July 1, 1889 .....	28,616.87
Which will be entirely absorbed.	
Appropriation for civil establishment, 1889.....	46,580.70
Expended from July 1, 1888, to June 30, 1889 .....	45,111.34
Balance on hand July 1, 1889.....	1,469.36
Which will revert to the Treasury.	
Appropriation for contingent, 1889 .....	20,000.00
Expended from July 1, 1888, to June 30, 1889 .....	19,087.16
Balance on hand July 1, 1889 .....	912.84
Which will be quite, if not entirely, absorbed.	
Appropriation for naval asylum, 1889.....	82,367.00
Expended from July 1, 1888, to June 30, 1889.....	46,256.95
Balance on hand July 1, 1889.....	36,110.05
Of which a small amount will revert to the Treasury after liabilities are paid.	
Appropriation, navy-yard, Boston, water-pipes .....	32,000.00
Expended from July 1, 1888, to June 30, 1889 .....	31,314.60
Balance on hand July 1, 1889.....	685.40
Which will be entirely absorbed.	
Appropriation, navy-yard, Brooklyn, N. Y. :	
Repairs to building on cob dock.....	5,000.00
Boiler-shop and wing to machine-shop .....	68,340.47
Quarters for civil engineers .....	10,000.00
Reconstructing building No. 7.....	60,000.00
	143,340.47
Expended from July 1, 1888, to June 30, 1889 .....	70,855.26
Balance on hand July 1, 1889.....	72,485.21
Which will be expended to complete several objects named.	
Appropriation for timber dry-docks, navy-yards, Brooklyn and Norfolk...1,100,000.00	
Expended from July 1, 1888, to June 30, 1889 .....	920,399.58
Balance on hand July 1, 1889.....	179,600.42
Which will be expended in completing the docks.	
Appropriation, navy-yard, League Island, Pa. :	
Improvement of grounds and construction of protection wall.....	75,000.00
Expended from July 1, 1888, to June 30, 1889.....	7,692.08
Balance on hand July 1, 1889.....	67,307.92
Which will be entirely absorbed.	
Appropriation, navy-yard, League Island, Pa. :	
Timber dry-dock.....	550,000.00
Expended from July 1, 1888, to June 30, 1889 .....	27,269.25
Balance on hand July 1, 1889.....	522,730.75
Which will be expended in completing the dock.	

**Appropriation, navy-yard, Mare Island, Cal. :**

Cisterns .....	\$46,364.00
Finishing boiler and machine-shop .....	4,200.00
Extending wharf .....	30,000.00
Crane scow .....	7,000.00
Pile-driver .....	5,000.00
Swinging crane .....	4,000.00
Mud-scow .....	4,500.00

101,064.00

Expended from July 1, 1888, to June 30, 1889 ..... 64,276.09

Balance on hand July 1, 1889 ..... 32,787.91  
 Which will be entirely absorbed.

**Appropriation navy-yard, Mare Island, Cal. :**

Continuing work on granite dry-dock .....	80,000.00
Expended from March 2, 1889, to July 1, 1889 .....	18,493.99

Balance on hand July 1, 1889 ..... 61,506.01  
 Which will be entirely absorbed.

Appropriation, navy-yard, Mare Island, Cal., 1887 ..... 191,595.00  
 Expended from July 1, 1886, to June 30, 1889 ..... 185,649.60

Balance on hand July 1, 1889 ..... 5,945.40  
 Which will be entirely absorbed for granite.

**Appropriation, navy-yard, Norfolk, Va. :**

Iron and steel shop .....	75,000.00
Railroad extension .....	10,000.00
Boiler-shop extension .....	14,488.00
Water system .....	15,000.00

114,488.00

Expended from July 1, 1888, to June 30, 1889 ..... 29,302.41

Balance on hand July 1, 1889 ..... 85,185.59  
 Which will be expended to complete the several objects named.

**Appropriation, navy-yard, Washington, D. C. :**

Electric fire-alarms, time signals, etc .....	1,000.00
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Entire appropriation expended July 1, 1889, to meet outstanding obligations for the above.

**Appropriation, navy-yard, Brooklyn, N. Y., 1887 :**

For repairing and preserving granite dry-dock .....	100,000.00
Expended from September 1, 1886, to June 30, 1889 .....	95,779.11

Balance on hand July 1, 1889 ..... 4,220.89  
 Which will be expended in completing necessary repairs.

**Appropriation, navy-yard, Mare Island, Cal., 1886 :**

Artesian well .....	10,000.00
Expended from July 1, 1885, to June 30, 1889 .....	9,852.56

Balance on hand July 1, 1889 ..... 147.44  
 Which will revert to the Treasury.

**Appropriation, navy-yard, Boston, Mass. :**

Rebuilding floating gate .....	31,000.00
Expended from July 1, 1887, to June 30, 1889 .....	12,916.47

Balance on hand July 1, 1889 ..... 18,083.53  
 Which will revert to the Treasury.

**Appropriation, navy-yard, Norfolk, Va. :**

Railroad extension .....	20,000.00
Expended from July 1, 1887, to June 30, 1889 .....	20,000.00

Appropriation, adjustable stern dock for naval station, Key West, Fla.... \$30,000.00  
No expenditures have been made out of the above appropriation up to July 1, 1889.

Appropriation, naval station and coaling depot, Port Royal, S. C.:  
Fencing ..... 228.00  
Artesian well ..... 1,000.00  
Boat-house ..... 400.00  
1,628.00  
Expended from July 1, 1888, to June 30, 1889..... 728.00

Balance on hand July 1, 1889..... 900.00  
Which will be expended for artesian well.

Appropriation, commissioners on new navy-yards and dry-docks, Gulf of Mexico and South Atlantic and Pacific coasts..... 15,000.00  
Expended from July 1, 1888, to June 30, 1889..... 8,002.51

Balance on hand July 1, 1889..... 6,997.49  
Which will be quite, if not entirely, absorbed.

*Estimates of appropriations required for the service of the fiscal year ending June 30, 1891, by the Bureau of Yards and Docks, Navy Department.*

Detailed objects of expenditure, and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Total amount to be appropriated under each head of appropriation	Amount appropriated for the current fiscal year ending June 30, 1890.
<b>SALARIES.</b>			
One chief clerk, increase of \$450, submitted (Feb. 26, 1889) ..	\$2,250.00		
One draughtsman and clerk (same act) .....	1,800.00		
One clerk of class four (same act) .....	1,800.00		
One clerk of class three (same act) .....	1,600.00		
One clerk of class two (same act) .....	1,400.00		
One clerk of class one (same act) .....	1,200.00		
One mail messenger (same act) .....	720.00		
One laborer (same act) .....	600.00		
		\$11,430.00	\$10,800.00
<p>NOTE.—It is respectfully submitted that the salary of the chief clerk has remained unchanged from July 1, 1853, to the present time, at the rate of \$1,800 per annum, while the salaries of the chief clerks of the bureaus, offices, and heads of divisions (so called) of the other departments of the Government range from \$2,000 to \$2,500 per annum, and it is believed that the duties of the latter are not more responsible and arduous, or require greater professional knowledge or technical ability in their performance than is required of and performed by the chief clerk of the Bureau of Yards and Docks, and an increase of \$450 per annum to his present salary is urgently recommended.—G. B. WHITE, <i>Chief of Bureau.</i></p>			
<b>GENERAL MAINTENANCE.</b>			
For general maintenance of yards and docks, namely: For freight, transportation of material and stores, books, maps, models, and drawings, purchase and repair of fire-engines, machinery, repairs on steam fire-engines, and attendance on the same, purchase and maintenance of oxen, horses, and driving-teams, carts, timber-wheels, and all vehicles for use in navy-yards, tools and repairs of the same, postage on letters and other mailable matter on public service sent to foreign countries, and telegrams, stationery, furniture for Government houses and offices in the navy-yards, coal and other fuel, candles, oil, and gas, cleaning and clearing up yards and care of buildings, attendance on fires, lights, fire-engines, and apparatus, for incidental labor at navy-yards, water-tax, tools, and ferrage, rent of four officers' quarters at Philadelphia, Pa., pay of watchmen in navy-yards, awnings and packing-boxes, and advertising for yards and docks purposes (March 2, 1889) .....	300,000.00	300,000.00	185,000.00

*Estimates of appropriations required for the service of the fiscal year, etc.—Continued.*

Detailed objects of expenditure, and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Total amount to be appropriated under each head of appropriation	Amount appropriated for the current fiscal year ending June 30, 1890.
<b>CONTINGENT.</b>			
For contingent expenses that may arise at navy-yards and stations (March 2, 1889) .....	\$40,000.00	\$40,000.00	\$20,000.00
		340,000.00	185,000.00
<b>NAVAL HOME, PHILADELPHIA, PA.</b>			
One superintendent (March 2, 1889) .....	600.00		\$600.00
One steward, increase of \$120, submitted (same act) .....	600.00		480.00
One matron, increase of \$120, submitted (same act) .....	480.00		360.00
One chief cook, increase of \$240, submitted (same act) .....	480.00		240.00
One assistant cook, increase of \$192, submitted (same act) .....	360.00		168.00
One assistant cook, increase of \$132, submitted (same act) .....	300.00		168.00
One chief laundress (same act) .....	192.00		192.00
Four laundresses at \$168 each (same act) .....	672.00		1,008.00
Four scrubbers, at \$168 each (same act) .....	672.00		672.00
Eight waiters, at \$168 each (same act) .....	1,344.00		1,344.00
Eight laborers, two at \$240 each, submitted (same act) .....	1,920.00		1,440.00
One stable keeper and driver (same act) .....	360.00		360.00
One master-at-arms, increase of \$120, submitted (same act) .....	600.00		480.00
One barber (same act) .....	360.00		360.00
Two carpenters, one submitted at \$345 (same act) .....	1,690.00		845.00
Two painters, two submitted at \$600 each (same act) .....	1,200.00		
Two house corporals, increase of \$60 each, submitted (same act) .....	720.00		600.00
		12,550.00	
For water rent and gas (same act) .....	2,400.00		1,800.00
For cemetery, burial expenses, and headstones (same act) .....	350.00		350.00
For improvement of grounds (same act) .....	500.00		500.00
For repairs to buildings, furnaces, grates, ranges, furniture and repairs of furniture (same act) .....	4,500.00		4,500.00
For music in chapel (same act) .....	600.00		600.00
For fitting up bath-rooms for beneficiaries (submitted) .....	800.00		
For cementing floor of Home cellar (same act) .....			4,850.00
For transportation of indigent and destitute beneficiaries (same act) .....	500.00		500.00
For erecting elevator in main building, Naval Home (submitted) .....	4,000.00		
		13,650.00	
For support of beneficiaries (same act) .....	56,500.00	56,500.00	46,100.00
		82,700.00	68,517.00
<b>REPAIRS AND PRESERVATION.</b>			
For navy-yards and stations (March 2, 1889) .....	350,000.00	350,000.00	225,000.00
<b>NAVY-YARDS AND STATIONS.</b>			
Navy-yard, Portsmouth, N. H.:			
For increasing water supply (submitted) .....	6,350.00		
For completing hydrant system (submitted) .....	6,040.00		
		12,430.00	
Navy-yard, Boston, Mass.:			
For repairing timber-wharf No. 1 .....	15,000.00		
For new boiler and pumping machinery, taking down and resetting the end of granite-dry-dock, and putting in the necessary backing and drainage (submitted) .....	50,000.00		
For steel shears (submitted) .....	8,000.00		
For electric-lighting plant (submitted) .....	15,000.00		
For remodeling building No. 32 for offices for commandant, captain of the yard, and other officers (submitted) .....	7,500.00		
		95,500.00	
For rebuilding officers' quarters, "L, M, N, and O" (March 2, 1889) .....			28,610.00
Naval-yard, New London, Conn.:			
For building coal-shed (submitted) .....	500.00		
For rebuilding wharf (submitted) .....	6,500.00		
		7,000.00	
Navy-yard, Brooklyn, N. Y.:			
For extending railroad system and necessary rolling stock (submitted) .....	15,000.00		



*Estimates of appropriations required for the service of the fiscal year, etc.—Continued.*

Detailed objects of expenditure, and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Total amount to be appropriated under each head of appropriation	Amount appropriated for the current fiscal year ending June 30, 1890.
<b>NAVY-YARDS AND STATIONS—continued.</b>			
<b>Navy-Yard, Brooklyn, N. Y.—continued.</b>			
For completing approaches to timber dry-dock (submitted).....	\$30,000.00		
For extending brick wall around navy-yard (submitted).....	50,000.00		
For improvement of Whitney Basin (submitted).....	25,000.00		
For repairing cob dock and rebuilding sea-wall (submitted).....	100,000.00		
For relaying water-pipes in the yard (submitted).....	20,000.00		
For dredging (submitted).....	20,000.00		
For increasing electric-light plant (submitted).....	24,000.00	\$284,000.00	
For improving Whitney Basin and railroad throughout the yard, (March 2, 1889).....			\$55,000.00
<b>Navy-Yard, League Island, Pa.:</b>			
For extending permanent sea-wall (submitted).....	50,000.00		
For building permanent wharf, Sixteenth street (submitted).....	56,925.00		
For rebuilding Broad street wharf (submitted).....	91,400.00		
For building and furnishing one officer's quarters (submitted).....	10,000.00		
For constructing 2,000 feet of light retaining wall along water front of unused portion of the island (submitted).....	25,000.00		
For dredging and filling in (submitted).....	50,000.00		
For paving and improvement of grounds (submitted).....	14,500.00	300,825.00	
For landing wharf foot of Fifteenth street, 75 by 400 feet (same act).....			28,416.46
For dredging and filling in (same act).....			75,000.00
<b>Navy-Yard, Washington, D. C.:</b>			
For rebuilding quarters "A" and "B" (submitted)...	12,000.00		
For changing building No. 7 into an apartment house of three stories for additional quarters (submitted)...	10,000.00		
For changing old paint shop into a dwelling with two apartments (submitted).....	6,000.00		
For dredging and filling in (submitted).....	10,000.00	38,000.00	
For railroad track with all necessary switches, etc. (same act).....			15,000.00
<b>Navy-yard, Norfolk, Va.:</b>			
For extending permanent sea wall (submitted).....	25,000.00		
For completing railroad system (submitted).....	5,000.00		
For completing water system (submitted).....	5,000.00		
For extending wharf at St. Helena (submitted).....	20,000.00		
For completing approaches to timber dry-dock (submitted).....	10,000.00		
For connecting new pumps to old dry-dock (submitted).....	15,000.00		
For increasing electric light plant (submitted).....	15,000.00		
For extending machine-shop for steam engineering (submitted).....	5,000.00	100,000.00	
For building two officers' quarters (same act).....			16,000
<b>Naval station, Key West, Fla.:</b>			
For changing location of railroad, scale-house, and pump-house, made necessary by new Treasury building (submitted).....	1,000.00	1,000.00	
For two officers' quarters (same act).....			8,000.00
<b>Naval station and coaling-depot, Port Royal, S. C.:</b>			
For officers' quarters (same act).....			2,000.00
<b>Electric lighting of navy-yard:</b>			
For establishment of plant and the inauguration of electric lighting in the navy-yards at New York, Norfolk, Va., Washington, D. C., and Mare Island, Cal. (same act).....			60,000.00
<b>Navy-yard, Mare's Island, Cal.:</b>			
For completing repairs to sectional dry-dock (submitted).....	15,000.00		
For bridge across sectional dock-basin (submitted).....	2,000.00		
For boat landings (submitted).....	3,000.00		
For sinking artesian well, as much as may be necessary (submitted).....	20,000.00		

*Estimates of appropriations required for the service of the fiscal year, etc.—Continued.*

Detailed objects of expenditure, and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Total amount to be appropriated under each head of appropriation	Amount appropriated for the current fiscal year ending June 30, 1890.
<b>NAVY-YARDS AND STATIONS—continued.</b>			
<b>Navy-yard, Mare's Island, Cal.—Continued.</b>			
For building wagon-road toward cemetery, magazine, etc. (submitted) .....	\$5,000.00		
For replanking wharves (submitted) .....	5,000.00		
For completing electric-light plant (submitted) .....	30,000.00		
For moving ferry-slip back and straightening sea-wall (submitted) .....	20,000.00		
For dredging (submitted) .....	10,000.00		
For gate and guard-house (submitted) .....	10,000.00		
		\$120,000.00	
For iron-plating shop (same act) .....			\$5,755.40
For roads along water-front and about shops (same act) .....			5,000.00
For extending quay-wall (same act) .....			55,000.00
For continuing work on granite dry-dock (same act) .....			80,000.00
		958,755.00	431,781.80
<b>CIVIL ESTABLISHMENT.</b>			
<b>Navy-yard, Portsmouth, N. H.:</b>			
One clerk, at \$1,400 per annum (same act) .....	1,400.00		1,400.00
One mail messenger, at \$600 per annum (same act) .....	600.00		600.00
One messenger, at \$600 per annum (same act) .....	600.00		600.00
One foreman laborer and head teamster, at \$4 per diem* (same act) .....	1,400.00		1,400.00
One janitor, at \$600 per annum (same act) .....	600.00		600.00
One pilot, at \$3 per diem* (same act) .....	1,095.00		1,095.00
		5,755.00	
<b>Navy-yard, Boston, Mass.:</b>			
One clerk, at \$1,400 per annum (same act) .....	1,400.00		1,400.00
One foreman laborer, at \$4 per diem (same act) .....	1,252.00		1,252.00
One messenger to commandant, at \$1.76 per diem (same act) .....	550.88		550.88
One messenger, at \$1.76 per diem (same act) .....	550.88		550.88
One mail messenger, at \$600 per annum (same act) .....	600.00		600.00
One writer, at \$1,017.25 per annum (submitted) .....	1,017.25		
One draughtsman, at \$5 per diem (submitted) .....	1,565.00		
		6,936.01	
<b>Navy-yard, Brooklyn, N. Y.:</b>			
One clerk, at \$1,400 per annum (same act) .....	1,400.00		1,400.00
One writer, at \$1,017.25 per annum (same act) .....	1,017.25		1,017.25
Three writers, one at \$500 per annum; two at \$1,017.25 per annum (submitted) .....	2,934.50		
One foreman laborer, at \$4.50 per diem (same act) .....	1,408.50		1,408.50
One mail messenger, at \$750 per annum, increase of \$150, submitted (same act) .....	750.00		608.60
Two messengers, at \$2.25 per diem each (same act) .....	1,408.50		1,408.50
One draughtsman, at \$5 per diem (same act) .....	1,565.00		1,565.00
One quartermaster, at \$4 per diem (submitted) .....	1,252.00		
One superintendent of teams or quartermaster, at \$4 per diem (same act) .....	1,252.00		1,252.00
One messenger to commandant, at \$2.50 per diem, increase of 25 cents per diem submitted (same act) .....	912.50		821.25
		13,900.25	
<b>Sackett's Harbor (naval station):</b>			
One ship-keeper, at \$1 per diem* (same act) .....	365.00		
		365.00	365.00
<b>Navy-yard, League Island, Pa.:</b>			
One clerk, at \$1,400 per annum (same act) .....	1,400.00		1,400.00
One writer, at \$1,017.25 per annum (submitted) .....	1,017.25		
One messenger, at \$2 per diem (same act) .....	626.00		626.00
One foreman laborer, at \$4 per diem (same act) .....	1,252.00		1,252.00
One draughtsman, at \$5 per diem (submitted) .....	1,565.00		
One telegraph operator, at \$1,000 per annum (submitted) .....	1,000.00		
One leveler, at \$3.84 per diem (submitted) .....	1,200.00		
One rodman, at \$2.56 per diem (submitted) .....	800.00		
		8,800.25	
<b>Navy-yard, Washington, D. C.:</b>			
One clerk, at \$1,400 per annum (same act) .....	1,400.00		1,400.00
One messenger, at \$2 per diem, increase of 24 cents per day submitted (same act) .....	626.00		550.88

\* Including Sundays.

*Estimates of appropriations required for the service of the fiscal year, etc.—Continued.*

Detailed objects of expenditure, and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Total amount to be appropriated under each head of appropriation.	Amount appropriated for the current fiscal year ending June 30, 1896.
<b>CIVIL ESTABLISHMENT—continued.</b>			
<b>Navy-yard, Washington, D. C.—Continued.</b>			
One foreman laborer, at \$4 per diem (same act) .....	\$1,252.00	-----	\$1,252.00
One mail messenger, at \$2.50 per diem* (submitted) .....	912.50	-----	
One janitor, at \$2 per diem (submitted) .....	626.00	-----	
		<b>\$4,816.50</b>	
<b>Navy-yard, Norfolk, Va.:</b>			
One clerk, at \$1,400 per annum (same act) .....	1,400.00	-----	1,400.00
One writer, at \$1,017.25 per annum (same act) .....	1,017.25	-----	1,017.25
One writer, at \$1,017.25 per annum (submitted) .....	1,017.25	-----	
One foreman laborer, at \$4 per diem (same act) .....	1,252.00	-----	1,252.00
One mail messenger, at \$2 per diem* (same act) .....	730.00	-----	730.00
Two messengers, at \$2 per diem (same act) .....	1,252.00	-----	1,252.00
One pilot, at \$2.26 per diem (same act) .....	707.38	-----	707.38
One draughtsman, at \$5 per diem (submitted) .....	1,665.00	-----	
		<b>8,940.88</b>	
<b>Navy-yard, Pensacola, Fla.:</b>			
One clerk, at \$1,200 per annum (same act) .....	1,200.00	-----	1,200.00
One mail messenger, at \$600 per annum (same act) .....	600.00	-----	600.00
One lamp-lighter, at \$550 per annum (submitted) .....	550.00	-----	
		<b>2,350.00</b>	
<b>Navy-yard, Mare Island, Cal.:</b>			
One clerk, at \$1,400 per annum (same act) .....	1,400.00	-----	1,400.00
One writer, at \$1,017.25 per annum (same act) .....	1,017.25	-----	1,017.25
One foreman mason, at \$6 per diem (same act) .....	1,878.00	-----	1,878.00
One foreman laborer, at \$5.50 per diem (same act) .....	1,721.50	-----	1,721.50
One pilot, at \$4 per diem (same act) .....	1,502.40	-----	1,502.40
One draughtsman, at \$5 per diem (same act) .....	1,565.00	-----	1,565.00
One mail messenger, at \$2.74 per diem* (same act) .....	1,000.10	-----	1,000.10
One messenger, at \$2.20 per diem (same act) .....	688.60	-----	688.60
One messenger and lamp-lighter, at \$2.20 per diem (same act) .....	688.60	-----	688.60
One bell-ringer, at \$2.26 per diem (same act) .....	707.38	-----	707.38
One janitor, at \$2.20 per diem (submitted) .....	688.60	-----	
		<b>12,857.43</b>	
<b>Naval station, Key West, Fla.:</b>			
One messenger, at \$600 per annum (submitted) .....	600.00	600.00	
		<b>65,381.33</b>	<b>66,764.00</b>

\* Including Sundays.

## NO. 10.—BUREAU OF EQUIPMENT AND RECRUITING.

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NAVY DEPARTMENT,  
BUREAU OF EQUIPMENT AND RECRUITING,  
*Washington, October 1, 1889.*

SIR: I have the honor to forward herewith the report of my predecessor in office, showing the operations of the Bureau during the fiscal year 1888-'89, and to submit, as supplementary thereto, estimates for the fiscal year 1890-'91.

A considerable increase in the estimate under equipment of vessels will be noted. The amount appropriated for the current year was \$675,000, and the amount asked for is \$900,000, \$225,000 over the appropriation for the present year.

I have to state in explanation of this increase, that the needs of the Navy under this appropriation are gradually becoming greater with the construction of modern steel vessels of great steaming capacity and diminished sail-power, and these increased demands upon the appropriation which supplies coal have now reached such a point that only a small portion of the vessels of the Navy can be kept in commission, unless further provision be made by Congress for their maintenance. The new ships are large coal-consumers, and I beg to direct attention especially to the consideration that, as the building of these high-powered vessels has become the policy of the Government, the increased demands of the Navy in the matter of coal must be recognized to give effect to the purpose of Congress.

As a basis of comparison, it may be stated that the *Dolphin*, which is the smallest of the new steel vessels in commission, consumed during the fiscal year just closed coal of the value of about \$35,000. The coal consumption of the larger vessels, such as the *Chicago*, *Atlanta*, *Boston*, *Baltimore*, and *Charleston*, is much greater, but assuming that it is no greater, and assuming further that twenty-five vessels are to be maintained in commission (which is less than the usual number), it is apparent that for coal alone the sum of \$875,000 is needed to keep the Navy in a serviceable condition. But as the appropriation "Equipment of vessels" is also largely drawn upon for the numerous expenditures necessary to prepare and keep up equipment outfit and stores of vessels in commission and fitting for sea, the necessity of an appropriation of at least \$900,000 readily becomes apparent. Under existing and coming conditions the service can not possibly be maintained in a state of efficiency, under these heads, with less money.

During the last fiscal year (1888-'89) a deficiency of over \$100,000 is shown in the final balances, which was caused largely by expenditures

on foreign stations which could not be foreseen. The appropriation was \$625,000, and was so far exhausted by the 1st of March that all work on the equipment of vessels fitting out was ordered stopped and a large proportion of requisitions for necessary supplies was disapproved, great embarrassment to the service resulting.

Prior to 1875 the appropriation for the equipment and coaling of vessels was \$1,500,000 annually, and this was when all the steam-cruisers had large auxiliary sail-power, which was employed where possible, as at present under necessarily limited conditions, to save coal. The necessities of the service in this respect are now greater, and soon will be, with the placing in commission of vessels now in an advanced state of construction, *very much greater*, than during the period referred to; and yet, less than half the amount stated is appropriated for this purpose for the present fiscal year. I am therefore convinced that at least \$200,000 additional for this year, which should be estimated for as a deficiency, is absolutely necessary, to avoid the embarrassment and injury to the service which are inevitable under the present conditions.

From the time of the large reduction in the appropriation the amounts granted have ranged from \$1,250,000 to \$625,000, and during this period the ships in commission have been kept in service only by the most rigid, and in some instances unprofitable, parsimony; by the utilization of obsolete material and stores left over from the period of the Civil War; by the practical laying up of vessels on foreign stations, owing to the want of fuel, and by sending the vessels to cruise without a proper outfit. All old material which could be utilized for this purpose has been consumed, and the fitting out of ships for commission has thus become a most serious matter.

NOTE TO ACCOMPANY ESTIMATE OF SALARIES FOR THE BUREAU. •

By the operation of General Order No. 372, certain duties were taken from this Bureau and other duties were imposed upon it. The change in the personnel of the Bureau, as compared with the provision for the current year, is thus accounted for. The Bureau is thereby able to drop one clerk of the second class and one of the first class and one copyist of the \$900 grade, but finds it necessary to ask for a clerk of the third class.

The following statement is submitted in explanation of the increase of \$450 in the salary of the chief clerk of this Bureau: The present pay of this officer is \$1,800, which was established about forty years ago, when salaries were proportionately low throughout the service, as it then existed, and which was then, doubtless, regarded as adequate compensation for men of the qualifications required to fill this responsible position. Since that time there has been a great relative increase in the cost of living, which has been recognized in the provision for all other branches of the Government by a corresponding increase in pay. Thus, there is no instance in any branch of the civil service in which a Bureau chief clerk receives less than \$2,000, while \$2,500 is usually paid in the larger Bureaus, and \$2,250 is an average.

It is also noted that as a matter of fact in no other instance is a Bureau chief clerk, other than in the Navy Department, vested by law (see section 178, Revised Statutes), in the absence of his chief, with the responsibilities of the Bureau by reason of acting as chief and signing its correspondence and papers, which are frequently of great importance,

and yet, with this increased responsibility, he receives \$200 less per annum than the lowest pay for the corresponding grade elsewhere. The propriety of the proposed increase is therefore manifest.

Very respectfully,

GEORGE DEWEY,  
*Chief of Bureau.*

The SECRETARY OF THE NAVY.

NAVY DEPARTMENT,  
BUREAU OF EQUIPMENT AND RECRUITING,  
*July 31, 1889.*

SIR: I have the honor to submit the following report of the operations of this Bureau for the fiscal year ending June 30, 1889.

During the fiscal year ending June 30, 1889, the following amounts were appropriated under the several branches of this Bureau:

Equipment of vessels .....	\$625,000.00
Transportation and recruiting .....	30,000.00
Contingent equipment and recruiting .....	15,000.00
Civil establishment .....	11,525.00
Training station (for apprentices) .....	14,000.00

To purchase the necessary stores and to refit partially or wholly vessels for sea, there were expended for materials \$177,501.09, for labor \$82,805.81, aggregating \$260,306.90, from the "Equipment of vessels."

Owing to the appropriation of smaller amounts than were estimated, there will be considerable deficiency in equipment and transportation and recruiting. The appropriation for contingent and coasters harbor, being controlled directly by the Bureau, has not been exceeded, but that for equipment of vessels, being liable for expenditures abroad, that are always outside the direct control of the Bureau, has been exceeded, owing to exigencies of service that could not be anticipated.

#### COAL.

To supply coal to vessels on home and foreign service, including original cost and expense of handling, \$415,900.

#### HEMP.

There were purchased during the year 58 tons Russia hemp, costing \$12,283.83.

And there were remaining on hand at the Boston navy-yard, June 30, 1889, 50,764 pounds Manila hemp, costing \$3,885.17, and 19,492 pounds Russia hemp, costing \$1,871.23.

#### ROPE-WALK.

For the manufacture of the cordage needed by vessels in commission and for the cruisers building, the following amounts were manufactured, at the cost indicated:

49,351 pounds steel and iron rope .....	\$9,388.90
267 pounds copper-wire rope .....	160.20
294,033 pounds manila rope .....	38,279.47
120,459 pounds hemp rope .....	15,154.62
28,336 pounds small stuff .....	4,519.14
Aggregate .....	67,502.42

There were remaining on hand June 30, 1889, 128,190 pounds steel and iron wire, costing \$10,218.21.

## FORGE, CHAIN, AND GALLEY SHOPS.

During the year a large amount of old scrap-iron has been bloomed up and rolled into bar-plate or worked into heavy forgings. The work done at Boston has been most satisfactory and economical. The concentration of this Bureau's plant at the Boston navy-yard has afforded advantages of great value in the character of work produced, and in the fact that there abounds a large number of most excellent workmen to choose from in filling vacancies or when increase of force becomes necessary.

## ROLLING-MILL.

During this year there were rolled 379,216 pounds of finished iron, costing \$12,502.17.

## GALLEY-SHOP.

Two galleys No. 3.....	\$2,994.25
Four galleys No. 1.....	10,433.66
Total.....	13,427.91

Repairs to a greater or less extent have been made to the galleys of the following-named vessels: *New Hampshire, Marion, Richmond, Trenton, Yantic, Pinta, Franklin, Jamestown, and Constellation.*

In addition to the above, galleys for the *San Francisco, Philadelphia, Newark, Concord, and Bennington* were commenced and nearly completed. The newer galley adopted has been supplemented by the addition of a steam-cooker, which will obviate the use of a number of implements for boiling used in the original design of this galley.

## SMITH AND CHAIN SHOP.

The work in these shops has been mainly in making anchors and chains for the new cruisers. The quality of the work has been maintained and the high standard of tests adhered to since my last report.

Chain manufactured during the year, 223,152 pounds, costing \$15,929.75; thirty-five anchors of all kinds, weighing 61,788 pounds, costing \$20,450.17.

## SAIL-LOFTS.

All sail and canvas-work for the Navy, including that for the new vessels building and in commission, has been done during the past year at Boston, except with work for vessels on the Pacific Coast fitting at Mare Island. It is believed this can be done at the Mare Island navy-yard with some saving. The following amounts have been expended:

For material.....	\$51,796.12
For labor.....	62,425.82

## RIGGING-LOFT.

As with the sail-lofts, the work of fitting new rigging is done at the Boston navy-yards, for vessels in commission and for the new cruisers; that of repair, usually at yards where ships refit. The following were the expenditures:

For material.....	\$37,170.41
For labor.....	42,556.53

## ENLISTED MEN.

On June 30, 1889, there were 8,147 men and apprentices in the service. The number allowed by law has averaged during the year the lawful quota.

Men allowed.....	7,500
Men enlisted at rendezvous.....	2,253
Men enlisted on shipboard.....	2,446
Discharged during the year.....	4,153
Honorably-discharged and continuous-service men in the Navy during the year.....	2,318
Desertions during the year.....	749
Deaths during the year.....	85
Men employed in Coast Survey.....	275
Men employed in Fish Commission.....	124
Men enlisted formerly apprentices.....	100
Men enlisted under continuous-service certificate.....	593

During this year inspections of the receiving-ships indicated a high standard of order and cleanliness. Much credit is due the various commanding officers for the care exhibited in enlisting men in accordance with the law and the regulations prescribed by the Department and for the excellent condition of the vessels.

During the year the following vessels stationed at the several seaboard ports were used as recruiting stations: U. S. R. S. *Wabash*, Capt. C. C. Carpenter, U. S. N., Boston; U. S. R. S. *Vermont*, Capt. A. W. Kirkland, U. S. N., New York; U. S. R. S. *St. Louis*, Capt. W. Whitehead, U. S. N., League Island; U. S. R. S. *Dale*, Commander Yates Stirling, U. S. N., Washington; U. S. R. S. *Franklin*, Capt. A. P. Cooke, U. S. N., Norfolk; U. S. R. S. *Independence*, Capt. J. W. Philip, U. S. N., Mare Island.

These vessels were at one time engaged in other service, and are at present moored alongside the dock and covered in. I can foresee in the near future that repairs of such extensive character will be needed by these old vessels to keep them habitable as will equal that of building new ships. In this event it will be well to consider the advisability of substituting barracks at each of the naval stations for all purposes of recruiting and for housing men.

During the last session of Congress three bills of importance were passed in the interest of the enlisted men of the Navy.

One other still remains to be acted upon, a bill relating to retirement from active service after a consecutive and continuous service of twenty years. I would especially recommend this measure to your consideration as one which would place the men of the Navy on a footing similar to their comrades of the Army. No measure that could be adopted in the interest of our enlisted men would tend with greater benefit to maintain and keep good seamen in the Navy. I would advert to the fact that the Department should adopt some more rigid standard than at present prevails regarding citizenship of those who are to serve on board our new ships now beginning to appear. The Bureau holds that a man or boy offering to enlist, should be a native-born American, or he should be a naturalized American, or if not naturalized he should have declared his intention to become a citizen. The principles which the law sets up to govern a man's right to vote as a means to maintaining the integrity of the Union, should also prevail to govern his right to defend this union of States in war. I am of opinion that these matters could be settled by General Order of the Department without legislation.



One other matter closely related to the discipline of the Navy is the need of a more uniform system of punishments for the minor offenses committed on board ship. After a great number of years with the great variety of reports of punishment made quarterly it would seem possible to so classify them alphabetically and to have assigned to each offense a suitable punishment, so that the same offense should be punished alike in every ship of the Navy. At the present time punishments for the same offense differ as widely as the station separating ships from each other.

#### ADDITIONAL COURSE OF INSTRUCTION FOR SEAMEN.

The indisputable advantage of having men equipped with knowledge of the new implements applied to all the new ships can hardly be overstated. The frequent applications received during the year from men anxious to secure the benefits of the instruction afforded at Washington and Newport, indicate their appreciation of the great importance of this benefit. The officers at the Washington navy-yard and at the Torpedo station at Newport have been most diligent and careful in their instruction of the classes under their charge. The manner in which their work is done is best illustrated by the efficiency of those passing into the service from these schools.

During the year, the number taken from the general service for this instruction has not exceeded forty-five; this number is not sufficiently large to give the new ships going into commission the numbers needed by them in the several departments. At least one hundred to one hundred and fifty should be taken each year for this instruction to serve as the legal quota will permit. I would suggest that all appointments as boatswains and gunners should be made from the list of those qualified by this advanced course of instruction.

#### TRAINING APPRENTICES FOR THE NAVY.

*Coasters' Harbor Island.*—This permanent headquarters of the training service is still under the command of Commander F. J. Higginson, U. S. Navy. Under the judicious management of this officer and his untiring interest in all that concerns the affairs of this important nursery of new seamen, the institution has grown into a most flourishing condition. During the last year the Bureau issued a complete set of regulations through which more uniformity in the methods of instruction and drill is attained.

There still remains a number of improvements needed at this station to improve its fitness for the better training of apprentices and to secure the property against the accidents of fire.

For example, a sea-wall should be built from a point near where the U. S. S. *New Hampshire* lies moored, to a point in the causeway, and then filled in from shore-line up to the wall, thus increasing the available drilling ground for artillery and infantry drills. A new engine should be bought to protect the outbuildings and other property now on the island; this seems to the Bureau imperatively needed.

The following exhibit shows the number of apprentices in the Navy on June 30, 1889:

On board stationary and cruising training ship.....	661
On board cruising ships in general service.....	491
Total.....	1,152

These apprentices in the general service were distributed on the following stations :

North Atlantic.....	235
South Atlantic Station.....	134
Pacific Station.....	57
European Station.....	42
Asiatic Station.....	23
<b>Total.....</b>	<b>491</b>

There were 2,738 applicants for enlistment during the year. Of this number 1,846 were rejected for physical and other disqualifications, leaving 892 accepted. Of the number accepted, 194 failed to report after preliminary examination, so that the number actually admitted amounted to 698.

#### CRUISING TRAINING SHIPS.

The *Portsmouth*, *Jamestown*, and *Saratoga* were found by survey to be in need of such extended repairs to make them seaworthy after their last summer cruise, they were put out of commission and were extensively refitted. The *Saratoga* was transferred later to the city authorities of Philadelphia, and is at the present time completing her repairs at Portsmouth, N. H., for the new duty assigned to her. The *Jamestown* is now abroad on her summer cruise and the *Portsmouth* has just been recommissioned for the same service.

During the last winter cruise to the Windward Islands the *Constellation* took the place of the other cruisers, and under the command of Commander C. J. Train, U. S. Navy, made a most instructive cruise as far south as Trinidad in the Windward Group. This officer reported the most gratifying progress in the higher duties of the young apprentice's life on shipboard at sea, and the Bureau takes great pleasure in commending his interest and zeal in performing his duties.

The Bureau is of opinion that it would be wise policy to foster this apprentice system and to increase the number of enlistments annually to 1,500 instead of 750 as now allowed by law. It is believed that in the near future all the men of the service to fill the higher grades of petty officers will be drawn from these apprentices. It can be said now that commanding officers have brought to the Bureau's attention in flattering letters on many occasions the great value and efficiency of the apprentices under their command. The wish is frequently expressed for an increase in the number now allowed which can not be acceded to on account of the limited number available under the law.

#### PENSIONS.

The following table exhibits the pension cases acted upon by the Bureau during the fiscal year ending June 30, 1889, under the operations of sections 4756 and 4757, Revised Statutes of the United States.

	Claims pending July 1, 1888.	Claims filed, year ending June 30, 1889.	Claims allowed, year ending June 30, 1889.	Claims disallowed, year ending June 30, 1889.	Claims pending, year ending June 30, 1889.
For service of twenty years.....	45	36	24	6	51
For service of ten years.....	35	17	9	3	40
For renewal of pensions.....	5	14	17	1	1
For increase of pensions.....	2	7	3	1	5
For arrears of pensions.....	1	1	1	1	1
For restoration of pensions.....	1	3	2	1	1
<b>Total.....</b>	<b>87</b>	<b>78</b>	<b>55</b>	<b>12</b>	<b>98</b>

## NEW STEEL CRUISERS.

Work has continued throughout the year upon the new steel cruisers *Baltimore*, *Charleston*, *Petrel*, *Philadelphia*, *Bennington*, *Concord*, and *Newark*, in making chains, anchors, galleys, rigging, sails, and other equipment.

The reduced weights of all equipment outfit and stores being so important now, special allowances have been made looking to the reduction as far as practicable. Work upon most of these vessels is now going forward and in some entirely completed. A new feature of great importance in point of economy in their anchors has been the use of new cast-steel anchors of the Dunn type. The demand for high physical properties and superior tests has been met by the steel works, so that we now secure a more reliable, stronger, and cheaper anchor of steel than of iron.

In closing this official report of the Bureau's operations during the year, I close my immediate official connection with the Department. I desire therefore to express my sincere thanks for the confidence and uniform kindness accorded to me, and to wish your administration the most complete success.

With high regard, your obedient servant,

W. S. SCHLEY,  
*Chief of Bureau.*

Hon. B. F. TRACY,  
*Secretary of the Navy.*

*Statement of sales of condemned materials under cognizance of the Bureau of Equipment and Recruiting during fiscal year ending June 30, 1889, showing the materials sold, the parties buying the same, and the amount realized therefrom.*

Date of sale.	Where sold.	Materials sold.	Purchasers.	Amount realized.
1889, June 1.	Key West, Fla.	2 anchors, bower	Key West Commercial Company.	\$15.00
Do.	do	134 needles, roping	B. W. Johnson	.25
Do.	do	583 needles, sewing	Allen Curry	1.29
Do.	do	1 water cooler	John Williams	1.10
Do.	do	1 water cooler	F. Shavers	.90
Do.	do	1 water cooler	B. W. Johnson	.90
Do.	do	37 hooks, fishing	Allen Curry	.05
Do.	do	10 palms, sewing	B. W. Johnson	.70
Do.	do	15 palms, roping	do	.15
Do.	do	2 stoves, drying	do	1.00
Do.	do	3 stoves, drying	Cash & Curry	.45
Do.	do	3 stoves, drying	J. R. Chase	.30
Do.	do	17 stoves, drying	Roman Stevens	1.02
Do.	do	23 stoves, drying	B. W. Johnson	1.15
Do.	do	4 back-saw blades	George H. Bier	1.00
Do.	do	1 rule, 2-foot, boxwood	Cash & Curry	.05
Do.	do	23 shoe knives	do	.95
Do.	do	17 awls, saddlers'	do	.34
Do.	do	32 awls, sewing	Allen Curry	.05
Do.	do	20 pounds composition, sail-makers'	B. W. Johnson	.90
				26.96
	Auctioneer's fee			1.00
	Amount realized			26.96

*Estimates of appropriations required for the service of the fiscal year ending June 30, 1891, by the Bureau of Equipment and Recruiting, Navy Department.*

Detailed objects of expenditure, and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Total amount to be appropriated under each head of appropriation.	Amount appropriated for the current fiscal year ending June 30, 1890.
<b>SALARIES.</b>			
One chief clerk, increase of \$450, submitted (act February 26, 1889).....	\$2,250.00		
One clerk of class four (submitted).....	1,800.00		
One clerk of class three (submitted).....	1,600.00		
One of class two (act of February 26, 1889).....	1,400.00		
Two clerks of class one (same act) (one submitted).....	2,400.00		
Two copyists (same act).....	1,800.00		
One assistant messenger (same act).....	720.00		
One laborer (same act).....	660.00		
		\$72,630.00	\$13,180.00
<b>EQUIPMENT OF VESSELS.</b>			
For the purchase of coal, including expenses of transportation, storage, and handling of same; hemp, wire, and other materials for the manufacture of rope and cordage; iron for the manufacture of anchors, cables, galleys, and chains; canvas for the manufacture of sails, awnings, hammock cloths, boom covers, tarpaulins, hammocks, bags; water for steam launches; stationery for equipment officers, and for the purchase of all other articles of equipment at home and abroad; and for the payment of labor in equipping vessels, and manufacture of equipment articles in the several navy-yards (act March 2, 1889).....		900,000.00	675,000.00
For purchasing and installing electric search-lights and their appurtenances on board ships of war (submitted) ..		25,000.00	
For installing an electric welding machine in the Boston navy-yard (submitted).....		12,000.00	
<b>NAVIGATION AND NAVIGATION SUPPLIES.</b>			
For foreign and local pilotage and towage of ships of war; services and materials in correcting compasses on board ship, and for adjusting and testing compasses on shore; nautical and astronomical instruments and repairs of nautical instruments for ships of war; naval signals and apparatus, namely, signal lights, lanterns, rockets, running lights; compass fittings, including binnacles, tripods and other appendages of ships' compasses; logs and other appliances for measuring the ship's way, and leads and other appliances for sounding; lanterns and lamps, and their appendages, for general use on board ship, including those for the cabin, ward room, and steerage, for the holds and store rooms; for decks and quarter-master's use; burning and other materials for flags, and making and repairing flags of all kinds; oil for ships of war other than used in the engineer department; candles, when used as a substitute for oil in binnacles and running lights; chimneys and wicks, and soap used in the navigation department; photographic instruments and materials; stationery for commanders and navigators of vessels of war, and for use of courts-martial; musical instruments and music for vessels of war; steering signals and indicators, and speaking tubes and gongs for signal communications on board vessels of war; and for introducing and maintaining electric lights on board vessels of war (act March 2, 1889).....		125,000.00	100,000.00
<b>ELECTRIC LIGHTING PLANTS.</b>			
For installing the monitor <i>Puritan</i> with an electric lighting plant (submitted).....		20,000.00	
For installing the United States ship <i>Lancaster</i> with an electric lighting plant (submitted).....		10,000.00	

*Estimate of appropriations required for the fiscal year ending June 30, 1891, etc.—Cont'd.*

Detailed objects of expenditure, and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Total amount to be appropriated under each head of appropriation.	Amount appropriated for the current fiscal year ending June 30, 1890.
<b>CIVIL ESTABLISHMENT—EQUIPMENT AND RECRUITING.</b>			
Navy-yard, Portsmouth, N. H.:			
One clerk (appropriated).....	\$1, 200. 00		
Navy-yard, Boston, Mass.:			
One superintendent of rope-walk (appropriated).....	1, 875. 00		
One clerk (appropriated).....	1, 400. 00		
One clerk (appropriated).....	1, 300. 00		
One writer (appropriated).....	950. 00		
Navy-yard, New York:			
One clerk (appropriated).....	1, 200. 00		
Navy-yard, League Island, Pa.:			
One clerk (appropriated).....	1, 200. 00		
Navy-yard, Norfolk, Va.:			
One clerk (appropriated).....	1, 200. 00		
Navy-yard, Mare Island, Cal.:			
One clerk (appropriated).....	1, 200. 00		
		\$11, 525. 00	\$11, 525. 00
<b>CIVIL ESTABLISHMENT—NAVIGATION.</b>			
Navy-yard, Portsmouth, N. H.:			
One clerk (appropriated).....	1, 000. 00	.	
Navy-yard, New York:			
One writer (appropriated).....	1, 000. 00		
One store-keeper (appropriated).....	900. 00		
Navy-yard, Norfolk, Va.:			
One clerk (appropriated).....	1, 200. 00		
Navy-yard, Washington, D. C.:			
One clerk (appropriated).....	1, 000. 00		
		5, 100. 00	5, 100. 00
<b>CONTINGENT, BUREAU OF EQUIPMENT AND RECRUITING.</b>			
For freight and transportation of equipment and navigation stores, packing boxes and materials, printing, advertising, telegraphing, books and models, postage on letters sent abroad, ferrriage, ice, lighterage of ashes, and emergencies arising under cognizance of the Bureau of Equipment and Recruiting unforeseen and impossible to classify (act March 2, 1889) .....		20, 000. 00	15, 000. 00

**U. S. NAVAL OBSERVATORY,**  
Washington, June 18, 1889.

SIR: In compliance with the Bureau's order of the 17th instant (No. 5534), I have the honor to submit estimates, in duplicate, of appropriations required for the support of the Naval Observatory for the fiscal year ending June 30, 1891.

The recommendation for an increase of the pay of the assistant astronomers and of the instrument-maker is respectfully renewed. The salaries of the former are not commensurate with the importance of their work; nor are they sufficient to induce competent men to regard their connection with the Observatory as permanent. Resignations, to accept better appointments, have been very frequent. One assistant astronomer resigned last year, and another may leave within a few months. These frequent changes, which are manifestly injurious to the work of the Observatory, can be prevented only by paying these gentlemen what their services are worth, and what they so often can obtain in other situations.

The instrument-maker now receives, after more than twenty years' continuous service, much less pay than is given to those holding similar positions in other branches of the Government service. His duties are many, and they have been thoroughly and satisfactorily performed, and the increase asked for is deemed justly due to him.

The computation of the observations with the transit-circle is several years in arrears. In order to bring the work up to date, that it may be promptly published, an estimate for an additional computer is submitted. It is extremely desirable that this work be completed at the earliest moment possible.

The library has grown to such proportions as to require the services of an assistant librarian. The make-shift of assigning an officer of the Navy to that duty has been shown by experience to be a lamentable failure, not through want of ability, but because of the frequent changes of officers so assigned.

The extension of the field at the Observatory during the past years has increased the amount of clerical labor to such a degree as to warrant the recommendation for a copyist.

The estimate for the extension and maintenance of the time service is renewed. This service has proved very valuable to the public generally, and it is hoped that it will be encouraged. At present, signals to the several time-ball stations are transmitted by the Western Union Telegraph Company without cost, and several of the time-balls are hoisted and cared for by private individuals without compensation. The importance of the time-service demands that it should be established on a firm and independent basis, which can be done only by an adequate appropriation.

Very respectfully,

R. L. PHYTHIAN,  
Captain, U. S. Navy, Superintendent.

The CHIEF OF THE BUREAU OF EQUIPMENT AND RECRUITING,  
Navy Department.

*Estimates of appropriations required for the service of the fiscal year ending June 30, 1891,  
by the U. S. Naval Observatory.*

Detailed objects of expenditure, and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Total amount to be appropriated under each head of appropriation.	Amount appropriated for the current fiscal year ending June 30, 1890.
<b>SALARIES.</b>			
One assistant astronomer (acts Aug. 5, 1882; Feb. 26, 1889).....	\$2,000.00	.....	.....
Two assistant astronomers, at \$1,800 each (same acts).....	3,600.00	.....	.....
One clerk of class four (same acts).....	1,800.00	.....	.....
One instrument-maker (same acts).....	1,500.00	.....	.....
Four watchmen, including one for new Naval Observatory grounds (same acts).....	2,880.00	.....	.....
One skilled laborer, at \$1,000; one skilled laborer at \$720 (same acts).....	1,720.00	.....	.....
Seven laborers, at \$660 each (same acts).....	4,620.00	.....	.....
Two computers, at \$1,200 each (same acts).....	2,400.00	.....	.....
		\$20,520.00	\$20,520.00
<b>NOTE.</b> —The following additional estimates are submitted:			
Increase to pay of one assistant astronomer .. \$600			
Increase to pay of two assistant astronomers, of \$400 each .....	800		
Increase to pay of instrument maker.....	500		
One computer.....	1,200		
One copyist.....	900		
One assistant librarian .....	1,200		
One laborer for care of compass-houses .....	660		
Total.....	5,860		
<b>CONTINGENT AND MISCELLANEOUS EXPENSES.</b>			
Miscellaneous computations (acts Aug. 5, 1882; Feb. 26, 1889).....	1,200.00	.....	.....
Books, periodicals, engravings, photographs, and fixtures for the library (same acts).....	1,000.00	.....	.....
Apparatus and instruments and for repairs of the same (same acts).....	2,500.00	.....	.....
Repairs of buildings, fixtures, and fences; for fuel, furniture, gas, chemicals, stationery, freight, foreign postage, expressage, fertilizers, plants, and all contingent expenses (same acts).....	4,500.00	.....	.....
Payment to Smithsonian Institution for freight on Observatory publications sent to foreign countries (same acts) ..	136.00	.....	.....
Extension and maintenance of the time service (submitted) ..	5,000.00	.....	.....
		14,336.00	9,336.00

NAUTICAL ALMANAC OFFICE, NAVY DEPARTMENT,  
Washington, D. C., September 3, 1889.

SIR: I have the honor to submit the following explanation of the estimate of \$300 to purchase materials for multiplying copies of work on new tables of the planets.

The work itself comprises a recalculation of the more important astronomical observations made upon the planets at the leading observatories of the world since 1750, and has been carried on with the expectation of its becoming a standard among astronomers which will endure at least until the middle of the coming century.

The printing of the work would require several quarto volumes, costing several thousand dollars each. Instead of printing, it is proposed to distribute about twenty copies among the leading observatories and astronomical institutions of the world, with the view of securing examination and criticism before the results are finally obtained, and also to save the time and expense of printing in detail.

Very respectfully, your obedient servant,

S. NEWCOMB,  
Superintendent Nautical Almanac Office.

The CHIEF OF THE BUREAU OF EQUIPMENT AND RECRUITING.

*Estimates of appropriations required for the service of the fiscal year ending June 30, 1891,  
by the Nautical Almanac Office.*

Detailed objects of expenditure and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Total amount to be appropriated under each head of appropriation.
<b>SALARIES.</b>		
Salaries of assistants in preparing for publication the American Ephemeris and Nautical Almanac, viz:		
Three assistants at \$1,600 each, acts Aug. 5, 1882; March 3, 1889)...	\$4,800.00	
Two assistants at 1,400 each (same acts) .....	2,800.00	
Three assistants at \$1,200 each (same acts) .....	3,600.00	
Two assistants at \$1,000 each (same acts) .....	2,000.00	
One copyist and typewriter (same acts) .....	900.00	
One assistant messenger (same acts) .....	720.00	
One laborer (same acts) .....	600.00	
Pay of computers on piece-work in preparing for publication the American Ephemeris and Nautical Almanac and in improving the tables of the planets .....	8,400.00	
		<b>\$23,400.00</b>
<b>MISCELLANEOUS EXPENSES.</b>		
For purchase of materials for multiplying copies of work on tables of the planets (submitted) .....	300.00	
NOTE.—For explanation of this estimate see Appendix.		

## NO. 11.—BUREAU OF NAVIGATION.

BUREAU OF NAVIGATION,  
NAVY DEPARTMENT,  
*Washington, October 15, 1889.*

SIR: I have the honor to submit the annual report of the operations of the Bureau of Navigation for the past fiscal year, together with the estimates for its support and that of the offices under it for the fiscal year ending June 30, 1891.

Included in this report and transmitted herewith are the reports of the Superintendent of Compasses; the Naval Inspector of Electric Lighting; the Hydrographer to the Bureau of Navigation; the Superintendent of the Naval Observatory; the Superintendent of the Naval Academy; the Superintendent of the Nautical Almanac, and the officer in charge of the Navy Department Library and War Records.

A provision of the act making appropriations for the Navy for the fiscal year ending June 30, 1889, joined the Naval War College and Torpedo Station under one command after January 1, 1889, thereby transferring the former to the control of the Bureau of Ordnance. The operations of the War College for the session of 1888 are described in my report of that year.

General Order No. 372, dated June 25, 1889, transferred the Compass Office, the Nautical Almanac Office, the Naval Observatory, and Electric Lighting to the Bureau of Equipment and Recruiting.

Therefore, while noting the operations of these offices for the year covered by this report, I leave recommendations respecting them to the chief of the Bureau to which they are now attached. The Naval Academy was, by the provisions of the same order, placed under the control of this Bureau.

*Compass Office.*—During the past year ten 7½-inch compasses, eight tell-tale compasses, seventy-one boat compasses, and thirteen azimuth circles of obsolete pattern have been altered to conform to the standard patterns.

Four horizontal vibrating circles for observation of magnetic forces, four vertical force instruments, six clinometers, and eight peloruses were purchased.

Owing to the exhaustion of the appropriation for instruments pertaining to the Compass Office, it has been necessary to defer the repairs of a number of compasses until the next fiscal year.

The ten compensating binnacles for use in the steel ships, spoken of in my last report, were delivered by the makers and placed on board the ships needing them.



A set of magnetic instruments, for use in connection with the compensating binnacles, is now supplied to all steel or iron vessels.

Magnetic surveys of the new cruisers, and observations for magnetic forces on board of them, have been made whenever opportunity offered.

I beg to call attention to the appended report of the Superintendent of Compasses, in which he refers to the danger liable to arise from the proximity to the compasses of dynamos and electric motors.

*Electric lighting.*—The report of the Naval Inspector of Electric Lighting, Commander R. B. Bradford, U. S. N., indicates in detail the large amount of work performed under the direction of that officer during the past year. I commend his report and recommendations to your favorable consideration.

At an early date this Bureau interested itself in the subject of introducing electrical appliances, and especially incandescent electric lighting on board ship. In 1882 I asked for a special appropriation for installing a trial lighting plant on board ship, and the result was the installation of electric lights in the *Trenton*, which was the first man-of-war in the world to be lighted by electricity. When she was re-commissioned last this plant was renovated and put in thorough order, and was so successful that light was furnished by it up to the time of her destruction at Samoa on the 16th of March last, the dynamo having stopped only when steam failed. Commander Bradford superintended this installation, and since that time has been identified with similar work in the new ships, and in such of the old ones as have received plants, as Naval Inspector of Electric Lighting. Under his instruction and control a number of young officers have been trained in all the practical details of installation on board ship, the result being that there is now a small corps of naval experts in this important branch of equipment.

Since the 1st of July last the duties of this office have been carried on under the direction and supervision of the Chief of Bureau of Equipment and Recruiting. Up to that date Commander Bradford, in addition to his duties as Naval Inspector of Electric Lighting, was my senior assistant and had supervision of all Bureau work. On account of his knowledge of the subject of electric lighting, I regarded it as important that he should continue to have charge of that work, and therefore his connection with the Bureau of Navigation ceased on the 1st of July much to my regret.

I believe that the consolidation of electrical appliances under one bureau will be of much benefit to the naval service.

*Hydrographic Office.*—The report of the Hydrographer gives an interesting account in detail of the operations of this valuable office, which has now been thoroughly reorganized.

The demands upon it have been so much increased that the appropriations to maintain its various services should be materially enlarged.

The necessity for a separate building, completely equipped and adapted to the technical work of the office, in which all its functions can be centralized, is imperative. Time will continue to be wasted so long as its different divisions are widely removed from each other. The building occupied by the draughtsmen and engravers is inadequate to their wants both in space and accommodations, and is without a suitable storage room for the engraved copper plates, which have cost more than \$300,000. Besides the chart-printing presses more room is needed for type-printing facilities for Notices to Mariners, Pilot Chart Supplements, and Sailing Directions, while a plant for lithographic work for the Office of Naval Intelligence as well as the Hydrographic Office would be a valuable economical addition.

I recommend, therefore, an appropriation of \$200,000 for the construction of a special building, and in the mean time, pending such construction, an increased current appropriation for the renting of suitable buildings.

Three new branch hydrographic offices have been established during the past year, making nine in all, situated in our most important maritime ports. The officers attached to them have visited 14,274 vessels, distributed more than 1,000,000 publications of use to mariners, compared and corrected thousands of charts and many nautical and meteorological instruments, and collected valuable nautical information which would otherwise have been lost.

These offices have become a recognized necessity at all points where they are in operation, and the system should be extended to include all ports of importance on the Atlantic, Gulf, and Pacific coasts and on the Great Lakes.

In conjunction with the Signal Service, steps have been taken by the Hydrographic Office to organize a corps of voluntary meteorological observers in the West Indies during the hurricane season.

This valuable service should be aided and encouraged by the Government in order to give shipping a proper warning of the approach of these destructive storms.

The Pilot Chart of the North Atlantic Ocean has been instrumental in calling general attention to the subject of floating wrecks by showing graphically their tracks from month to month, and has called the attention of the maritime world to the subject of lessening the risk of navigation.

I indorse the recommendation of the Hydrographer that a similar Pilot Chart for the Pacific Ocean be established, and recommend the necessary appropriation.

Upon information furnished by the Hydrographic Office and its branches many derelicts have been destroyed by public vessels, and others have been towed into port.

I repeat my recommendation of last year that a small vessel be assigned to the duty of destroying or removing these many floating wrecks and portions of wrecks in the tracks of vessels near our coast, which form a great and constant danger to navigation.

It will be observed that the removal of derelicts is one of the subjects included in the programme for the consideration of the International Marine Conference, quoted in this report. The matter is one of international importance, and it is to be hoped that the Conference will adopt a resolution assigning to each maritime power a certain ocean area with the duty of immediate removal of any floating obstruction which shall be reported as existing within that area.

Surveying work has been carried on to a greater or less extent by nearly all of our cruising vessels.

The *Ranger* has made valuable additions to our hydrographic, topographic, and magnetic knowledge of the west coast of Lower California, and the charts of this survey are highly commended by the growing commercial interests of the Pacific.

Special attention has been paid by the Hydrographer to the extension of our charts to cover those parts of the globe frequented by American vessels. Sixty-six new charts have been engraved and published during the year, covering localities in Newfoundland, on the coasts of California, Mexico, Central America, and Alaska, in the Pacific Islands and the East Indies.

Great circle charts of all the oceans have also been completed.

Longitude measurements and magnetic observations were successfully carried on last winter in Central America and Mexico, under the direction of Lieut. J. A. Norris, U. S. Navy. A party under the same officer is now preparing to spend the coming winter in similar work in the West Indies and along the Spanish Main.

Lieutenant Dyer, the present Hydrographer, who will probably soon be relieved from the charge of this office, has continued with energy and efficiency the excellent work commenced by his predecessor, Commander J. R. Bartlett, and I take this opportunity of expressing my appreciation of his services.

The Hydrographic Office is now by law placed under the control of the Bureau of Navigation. I strongly recommend that its transfer to the Bureau of Equipment and Recruiting be authorized by appropriate legislation. The charts, books, sailing directions, etc., supplied by this office form part of the equipment of ships, and the transfer recommended should be made to carry out more fully the reorganization of the business of the Navy Department directed by General Order No. 372.

*Naval Observatory.*—The report of the Superintendent of the Naval Observatory details the work performed with the great equatorial, transit circle, and other instruments. The estimates submitted by the Superintendent embrace one additional computer, one copyist, and one assistant librarian. The Bureau approves the request, and urges that the small appropriation asked for may be granted.

The chronometer and time-service department has been conducted satisfactorily. The daily time-signal at noon of the 75th meridian has been sent over the wires of the Western Union Telegraph Company, and time-balls have been dropped at various points on the coast. In the estimates for the Observatory, an appropriation is asked for to maintain this service properly, and to extend its benefits to other commercial cities. This estimate meets with the hearty approval of the Bureau, and the special attention of the Department is invited to this important item.

The Gardner system continues successfully to supply the public buildings in this city with the standard time from the Observatory.

The field of work of the Magnetic Observatory has been greatly enlarged. Magnetograph curves of declination are received from Toronto and Los Angeles. A comparison of the disturbances, on disturbed days, at these points and at Washington, is made by tracing the three curves reduced to the same scale over each other on the same sheet. Copies of these tracings are sent to observatories and persons interested in this class of observations.

The report of Lieut. A. G. Winterhalter, on the International Astrophotographic Congress, and on the various observatories of Europe, will soon be delivered by the Public Printer. Work upon the new Observatory on Georgetown Heights is progressing satisfactorily.

*Naval Academy.*—I beg to call your attention to the report of the Superintendent of the Naval Academy, and his cogent arguments to support the recommendations which he makes.

The building of the gymnasium, and the renewal of furniture in the cadets' quarters, are matters which affect the health and comfort of the cadets, and should not be deferred.

I urgently request your favorable indorsement of the proposition to build ten small houses for additional officers' quarters. The officers and assistant professors, some twenty in number, who now are obliged to rent houses outside of the Naval Academy, are those who receive the

smallest pay, and who are the least able to bear this extra expense. This increased cost of living is a frequent obstacle to obtaining the services, as instructors, of young officers, recently graduated, who are familiar with the constantly improving course of study and methods of teaching, and in this manner operates against the best interests of the school.

Following Captain Sampson's line of argument, with which I am entirely in accord, I recommend that the course be limited to four years; that the graduates to be retained in service be commissioned at once, and that the limits of the age of admission, now 15 and 20 years, be changed to 15 and 18.

*Office of Naval Intelligence.*—This office has continued, during the year, its current work of compiling and arranging information collected from all sources, and supplying this information, in a serviceable form, to the several bureaus of the Navy Department, and to the naval committees of Congress. Its value to naval legislation, and to naval administration, is now fully recognized.

In addition to this current work the usual annual publication has been issued, containing complete information as to the naval progress of the year in all parts of the world, and a number of papers upon leading professional topics.

Lient. R. P. Rodgers, U. S. Navy, to whose energy, industry, and ability, during the last four years, the office largely owes its increased scope and facilities and its present excellent organization and condition, has been relieved as Chief Intelligence Officer by Commander C. H. Davis.

*Library.*—The usual increase of books has taken place during the past fiscal year, and the catalogue is now nearly ready for the press. The selection of books, in accordance with the principle established seven years ago, has been confined exclusively to such as are needed in the various branches of professional study and investigation. In order to keep abreast of naval development, it is necessary to devote a considerable part of the appropriation to the purchase of professional journals. Technical works, as is well known, are expensive, and an increase in the appropriation for the library to \$2,500, as allowed prior to 1885, is desirable.

*War Records.*—The progress of the preparation of the War Records for publication is still delayed by the want of a sufficient clerical force. A slight increase was made by Congress last year, which took effect at the beginning of the current fiscal year. The force, however, is still far from being equal to the needs of the office. Estimates for an increase are herewith submitted. The additional force needed includes one clerk of class 4, to be employed in the preparation of statistical tables; two clerks of class 3, for the work of verification and classification; two clerks of class 2, for the examination of Bureau and fleet records, navy-yard records, log-books, and official papers received from officers and their representatives. The work laid out for the above clerks requires absolute accuracy, without which the publication will be worthless, and it is impossible to retain in the lower grades of the clerical service men of the proper standing and ability. Four additional copyists are asked for, at \$900 each. These are urgently needed for the actual work of copying records. At present no copyists of this grade are allowed to the office.

An assistant messenger is needed in the office in order to facilitate its work and avoid delay.

An appropriation of \$600 has been asked for necessary traveling expenses for the collecting of records. In order to secure the Confederate records it is indispensable that such an allowance should be made.

The importance of this work to the veterans of the war on both sides, and the lively interest with which they, as well as the citizens generally of all sections of the country, regard it, will, it is hoped, lead to its favorable consideration.

*Ships' libraries.*—The addition of books, both professional and miscellaneous, to the libraries of ships of war has been continued. It is now proposed to still further increase these libraries by about three hundred volumes more especially intended for the instruction and amusement of the enlisted men. A better educated and more intelligent class of men now enters the naval service. The training system, the favor of public opinion, and the changed conditions of life at sea tend to raise the standard and to retain good men, and it is probable that these influences will all be gradually strengthened. The leisure of these men must be looked to, and the careful selection of a library for their use is a wise provision to this end.

*International Marine Conference, to secure greater safety for life and property at sea.*—In my report of last year I called attention to the importance of adopting measures to increase the safety of navigation, and quoted the act of Congress, approved July 9, 1888, providing for an international marine conference to consider and recommend such measures. This conference is now, after much discussion of the subject, on the eve of entering upon its labors. The time of its meeting was fixed in the first instance by the President for the 17th of April last, but was afterwards postponed to the 16th of this month, because of the delay caused by the diplomatic correspondence necessary to a full understanding of the conference and its objects by the powers intending to participate.

The American delegates to the conference were appointed several months ago, in accordance with the act above referred to. They are Rear-Admiral S. R. Franklin, U. S. Navy; Capt. W. T. Sampson, U. S. Navy; S. I. Kimball, General Superintendent U. S. Life Saving Service; Capt. James W. Norcross, master merchant marine; Capt. John W. Shackford, master merchant marine; William W. Goodrich, a leading admiralty lawyer, and Clement A. Griscom, president of the International Navigation Company.

This delegation was called together in March last, and under the direction of the State Department formulated the following detailed programme of subjects to be considered by the International Marine Conference.

#### GENERAL DIVISION 1.

MARINE SIGNALS OR OTHER MEANS OF PLAINLY INDICATING THE DIRECTION IN WHICH VESSELS ARE MOVING IN FOG, MIST, FALLING SNOW, AND THICK WEATHER, AND AT NIGHT.—RULES FOR THE PREVENTION OF COLLISIONS AND RULES OF THE ROAD.

##### 1. Visibility, number, and position of lights to be carried by vessels

- (a) Steamers under way.
- (b) Steamers towing.
- (c) Vessels under way, but not under command, including steamers laying cable.
- (d) Sailing vessels under way.
- (e) Sailing vessels towing.
- (f) Vessels at anchor.
- (g) Pilot vessels.
- (h) Fishing vessels.

2. Sound signals; their character, number, range, and position of instruments:
  - (a) For use in fog, mist, falling snow, and thick weather, as position signals:
    - For steamers under way.
    - For steamers towing.
    - For sailing vessels under way.
    - For sailing vessels towing.
    - (These signals to show the approximate course steered if possible.)
    - For vessels at anchor.
    - For vessels under way, but not under command, including steamers laying cable.
  - (b) For use in all weathers as helm signals only:
    - For steamers meeting or crossing.
    - For steamers overtaking.
    - For steamers backing.
  - (c) Whether helm signals shall be made compulsory or remain optional.
3. Steering and sailing rules:
  - (a) Sailing vessels meeting, crossing, overtaking, or being overtaken by each other.
  - (b) Steamers meeting, crossing, overtaking, or being overtaken by each other.
  - (c) Sailing vessels meeting, crossing, overtaking, or being overtaken by steamers.
  - (d) Steamers meeting, crossing, overtaking, or being overtaken by sailing vessels.
  - (e) Special rules for channels and tide-ways, where no local rules exist.
  - (f) Conflict of international and local rules.
  - (g) Uniform system of commands to the helm.
  - (h) Speed of vessels in thick weather.

## GENERAL DIVISION 2.

## REGULATIONS TO DETERMINE THE SEAWORTHINESS OF VESSELS.

- (a) Construction of vessels.
- (b) Equipment of vessels.
- (c) Discipline of crew.
- (d) Sufficiency of crew.
- (e) Inspection of vessels.
- (f) Uniform certificate of inspection.

## GENERAL DIVISION 3.

## DRAFT TO WHICH VESSELS SHOULD BE RESTRICTED WHEN LOADED.

Uniform maximum load mark.

## GENERAL DIVISION 4.

## UNIFORM REGULATIONS REGARDING THE DESIGNATING AND MARKING OF VESSELS.

- (a) Position of name on vessels.
- (b) Position of name of port of registry on vessels.
- (c) Size of lettering.
- (d) Uniform system of draft marks.

## GENERAL DIVISION 5.

## SAVING LIFE AND PROPERTY FROM SHIPWRECK.

1. Saving of life and property from shipwreck at sea:
  - (a) Duties of vessels after collision.
  - (b) Apparatus for life saving to be carried on board ship. (Life-boats, life-preservers, life-rats, pumps, and fire-extinguishing apparatus.)
  - (c) The use of oil and the necessary apparatus for its use.
  - (d) Uniform inspections as to (b) and (c).
2. Saving of life and property from shipwreck by operations from shore:
  - (a) Organization of, and methods employed by, life-saving institutions.
  - (b) The employment of drilled and disciplined crews at life-saving stations.
  - (c) The maintenance of a patrol upon dangerous coasts by night and during thick weather by day, for warning off vessels standing into danger, and for the early discovery of wrecks.
  - (d) Uniform means of transmitting information between stranded vessels and the shore.
  - (e) Life-boats, life-saving apparatus and appliances.
3. Official inquiries into causes and circumstances of shipwrecks and other casualties.

## GENERAL DIVISION 6.

## NECESSARY QUALIFICATIONS FOR OFFICERS AND SEAMEN, INCLUDING TESTS FOR SIGHT AND COLOR BLINDNESS.

- (a) A uniform system of examination for the different grades.
- (b) Uniform tests for visual power and color blindness.
- (c) General knowledge of methods employed at life-saving stations.
- (d) Uniform certificates of qualification.

## GENERAL DIVISION 7.

## LANES FOR STEAMERS ON FREQUENTED ROUTES.

- (a) With regard to the avoidance of steamer collisions.
- (b) With regard to the safety of fishermen.

## GENERAL DIVISION 8.

## NIGHT SIGNALS FOR COMMUNICATING INFORMATION AT SEA.

- (a) A code to be used in connection with the International Code signal-book.
- (b) Or a supplementary code of limited scope to convey information of special importance to passing vessels.
- (c) Distress signals.

## GENERAL DIVISION 9.

## WARNINGS OF APPROACHING STORMS.

- (a) The transmission of warnings.
- (b) The uniformity of signals employed.

## GENERAL DIVISION 10.

## REPORTING, MARKING, AND REMOVING DANGEROUS WRECKS OR OBSTRUCTIONS TO NAVIGATION.

- (a) A uniform method of reporting and marking dangerous wrecks and derelicts.
- (b) The division of the labor, cost, and responsibility among the several maritime nations, either by geographical apportionment or otherwise:
  - Of the removal of dangerous derelicts;
  - And of searching for doubtful dangers with a view of removing them from the charts.

## GENERAL DIVISION 11.

## NOTICE OF DANGERS TO NAVIGATION.—NOTICE OF CHANGES IN LIGHTS, BUOYS, AND OTHER DAY AND NIGHT MARKS.

- (a) A uniform method of taking bearings, of designating them (whether true or magnetic), and of reporting them.
- (b) A uniform method of reporting, indicating, and exchanging information by the several maritime nations—to include the form of notices to mariners.
- (c) A uniform method of distributing this information.

## GENERAL DIVISION 12.

## A UNIFORM SYSTEM OF BUOYS AND BEACONS.

- (a) Uniformity in color of buoys.
- (b) Uniformity in numbering of buoys.

## GENERAL DIVISION 13.

## THE ESTABLISHMENT OF A PERMANENT INTERNATIONAL MARITIME COMMISSION.

- (a) The composition of the commission.
- (b) Its powers and authority.

This programme has been submitted to all foreign countries, and will form, subject to such alterations as may be decided upon by the conference in session, the basis of its deliberations.

The following countries have announced their intention of participating in the conference: Austria-Hungary, Brazil, Belgium, China, Chili, Costa Rica, Denmark, France, Germany, Great Britain, Guatemala, Hawaii, Honduras, Italy, Japan, Mexico, Norway, Nicaragua, Russia, Spain, Sweden, Siam, The Netherlands, Uruguay, and Venezuela. Of these the greater number have appointed their delegates.

The conference will probably open on the 16th instant, with not less than fifty delegates present, representing the important maritime powers of the world.

At the request of the American delegation, the Secretary of the Navy recently caused experiments to be made by naval vessels to determine the practical value of certain systems of running-lights and fog-signals which had been proposed for the consideration of the conference.

The experiments were satisfactorily carried out under the direction of Commander Chadwick, commanding the United States steamship *Yorktown*, and the report which he has made upon the subject will be of much value to the delegates. These experiments are the most thorough and complete which have ever been made in this country in connection with this important subject, bearing more directly than any other upon the safety of life and property at sea.

*Enlisted men.*—By the provisions of General Order, No. 372, dated June 25, 1889, the recruiting, training, discipline, and control of enlisted men for the Navy were transferred to this Bureau.

This charge, always important, has assumed new features and responsibilities, with the application of modern naval developments to our service, and it becomes my duty to call your attention to certain recommendations which I believe to be in the direction of increased efficiency.

(1) The term for which men are enlisted for general service, at present three years, should be extended to four. This change can be brought about by Department action, the law permitting enlistments for a period not exceeding five years, and its importance justifies the departure from long established custom. The regular and recognized duration of a cruise is three years. The men brought together in receiving ships, to form the crew of a vessel preparing for the pennant, frequently accomplish several months of their time before she is commissioned, and there is always more or less delay after commissioning to complete the outfit. It results that if a vessel be sent to a foreign station, the times of her men begin to expire soon after the second year of her cruise, and the 25 per cent. additional pay, which all men held over time receive, adds seriously to the expense of maintaining the enlisted force. This difficulty would be remedied and a considerable saving effected by a longer term of enlistment.

(2) There should be a change in the provisions relating to continuous service. I make the following recommendations with regard to men who wish to engage for continuous service:

(a) They shall permanently enlist, to serve until reaching the age of retirement.

(b) At the expiration of the first four years of their service, they shall, if they so elect, be discharged, but failing to so elect, they shall continue in the service.

(c) Any application for discharge after entering upon the fifth year of service, may be granted or refused at the discretion of the Navy Department.



(d) A continuous-service man shall be entitled to one month's leave for each year of service, to be granted at any time when convenient to the Navy Department, and to be cumulative up to four months. This is equivalent to the three months' bounty now paid for re-enlistment.

(e) A continuous-service man shall be entitled to \$1 per month additional pay for each completed term of four years' service, this increase to be added to the pay of any rate held by him.

(f) A discharge at any time shall cause the loss of all advantages in increased and retired pay accruing to the service already performed.

(g) A continuous-service man, after thirty years of service, shall be entitled to retirement, with half pay of the rate last held by him.

(h) The names of all continuous-service men, who have completed the first four years of service, shall be borne upon the Navy register.

(i) Present continuous-service men shall be permitted to enter upon the permanent enlistment and count their previous continuous-service time and receive all its advantages under the proposed scheme, but no new men, over twenty-five years of age, shall be accepted in this category.

(3) An age limit should be placed upon first entry for general service. Much more is demanded of naval seamen now than formerly. The standards of both general and technical acquirement have been much improved, and a man must begin younger and work harder to become expert in the management of new weapons. I recommend that no men, without previous naval service, above the age of thirty-five, shall hereafter be enlisted.

(4) The enlistment of aliens for general service should be discouraged, with a view to its final discontinuance. There are certain special services, such as those performed by musicians and servants, for which aliens are largely employed, to the great convenience and advantage of the naval service, especially upon foreign stations; but entries for the seaman and combatant force of foreigners who take service in our Navy as a transient occupation, for its temporary advantages, perhaps merely to obtain a passage from one part of the world to another, affect seriously the discipline and military efficiency of the Navy. I recommend, as a first step in this direction, that, with the exception of musicians and servants, who shall be enlisted for the cruise only of the ship in which they are to serve, no foreigners shall be enlisted, at home or abroad, unless they fairly speak and understand the English language, and have made application in proper form for naturalization papers. This will preserve the liberal policy of the United States Government to all foreigners who intend, in good faith, to become its citizens, and will dignify and improve the naval service.

(5) A change should be made in the apprentice system, with the view of retaining a larger percentage of trained apprentices in continuous service. We enlist them now to serve until the age of twenty-one. We lose command of them at precisely the age when there is the greatest necessity of retaining it, at the most critical time of their lives, when the sense of manhood's independence and the natural desire to escape from an apprenticeship which, at its best, like all educational careers, is frequently irksome and fatiguing, is unchecked by the wisdom that a few more years would bring.

It results that we lose the majority of them; and the cost of training the whole, divided among those who remain in the service, amounts to an alarming sum for each man so obtained. In England the training system which keeps boys in the service until the age of twenty-eight or thirty has revolutionized the character of the personnel. In America the training system which lets boys go at twenty-one, has appreciably improved,

but has not radically changed the character of our crews. We have a training system and an untrained service, and the results are not likely to change while the present system continues.

We should keep the trained boys in the service until their habits are formed, until they have thoroughly taken the shape of the naval mould, and become attracted by naval associations, and are much more likely to seek a re-enlistment, with its present advantages of bounty and future advantages of retirement, than to attempt to make new beginnings in untried fields. If there are any objections to establishing such a change in the relations of our naval apprentices to the service, I do not perceive them. It would be based, as the present service is, upon a voluntary contract which, if beyond the comprehension of the boy himself at the early age of entry, would be fully understood and appreciated by his parents or guardians. The training should be for the good of the Navy, not for the good of the boy. It is partial, not general; it applies to individuals, not like a system of public instruction to the mass of the people, and the State which bestows it has an undoubted right to make such conditions of future service as will afford a return for its cost. A logical feature of the system would be the obtaining of discharge only by purchase, *i. e.*, refunding to the state which is to lose the service of the boy the expense of his training. This purchase money would be a certain sum for each month spent in the training-ship, would reach its maximum at the end of the period of training proper, and would then gradually diminish to the end of the term of service. Such a condition would discourage inconsiderate entry, would diminish the number of applications for discharge, and would add stability to the training system.

I recommend that apprentices be enlisted to serve till the age of twenty-four, coupled with the condition that an apprentice, upon attaining his majority, shall be entitled to his discharge, if he so elects, upon refunding to the Government a certain sum as a partial compensation for the expenses of his training.

I recommend further an increase in the number of apprentices from 750, as now allowed by law, to 1,500, thus increasing the total enlisted force of the Navy to 9,000. An increase of the enlisted strength of the Navy in the near future is inevitable. It is no longer dependent now, as in the past, only upon the number of ships maintained in commission. The care and preservation of modern vessels of war while in reserve is an important feature of naval organization; and it has been found that this is most efficiently and economically accomplished by maintaining in them, while laid up, a certain percentage of their regular crews. This insures the keeping in good condition of motive power and gun machinery, and enables the vessels to be speedily brought forward for active service when required. It is desirable that this increase in the number of men should be anticipated by increasing the number of apprentices who will be properly trained. Of the proposed number I recommend that one-third may be enlisted between the ages of eighteen and twenty-one to form a special class, which shall remain in the training ships only one year, receiving no general school instructions, but devoting their time wholly to learning their military and naval duties, and at the end of that time to pass into the fleet.

The provision of the act of March, 1889, prescribing that an apprentice should receive a gratuitous outfit not to exceed \$45 in cost, has been carried into effect.

(6) The tenure of ratings and the regular advancement of men from

one to another, subject to certain qualifications of service and capacity, is an important subject which demands immediate attention. Our service is chaotic in this respect. As a rule the rates in a ship are the creations of the commanding officer, who has power to "reduce any rating established by himself" and who, upon turning over his command, effects a general disrating, in order that his successor may have the same free scope. At the pleasure of the commanding officer the chief petty officer of a ship may be disrated to landsman, and a landsman from the crew may be advanced to his position. I believe this power is, in the majority of cases, employed with good judgment, and generally with a conscientious sense of the obligations that are joined to it. It is a fact also that good, well-behaved petty officers are rarely disturbed in their rates, but it is also true that they have no certain right of property in them which they can assert and defend, and that they can be deprived of them at any moment without reason given or charges preferred, the regulation merely requiring the fact to be noted in the log.

This is as well understood on the berth-deck as it is in the cabin, and it diminishes the ambition to obtain a petty office and the pride in the possession of one. When a man may be elevated from the ranks one day and degraded to them the next, he looks with indifference upon his ephemeral honors and does not exert himself materially to get them or to keep them. The fact that petty officers do not have sufficient control and command over their men, and do not lead and influence them to subordination and good behavior, has constantly been deplored. It can not well be otherwise when our system of ratings keeps the level of the whole service at the level of the mass of unrated men. Our petty officers should be required to have more capacity, and should be clothed with more authority and given more importance. They should constitute a class apart. The distance between the rated and unrated personnel should be greater than it is, and that between the rated personnel and its commissioned superiors should be less. So much may be demanded from any individual in the crews of our new ships that numerous different grades of capacity and intelligence must be recognized, encouraged, rewarded, and preserved. A man who, by ability and faithfulness, has obtained a rate should be deemed to have acquired property in that rate, similar in kind, if less in degree, to which an officer enjoys in his commission.

It ought to depend on certain qualifications of service as well as of capacity, to be conferred by a board, and taken away only by a board, or by the sentence of a court-martial.

I have not overlooked the fact that our existing regulations provide, in certain cases, for enlistments of petty officers, thereby conferring rates which can not be reduced by a commanding officer. But the conditions are onerous and difficult to fulfill. In the first instance, twelve years' continuous service is required, three good-conduct badges must also be had, and very high marks must always have been obtained. It is anomalous that in a service whose requirements are low and discipline mild, where a man may be rated to any position in the crew without previous service or certified qualifications, a seaman can obtain a certain, assured, and permanent position as a petty officer only after a period of service amounting to a third of his active life-time.

I recommend a careful consideration of this subject, with a view to the establishment of such methods of advancement and tenure of ratings as shall secure merit in our petty officers and encourage them in the maintenance of a higher standard.

I suggest a board of ratings for each squadron, working under the provisions of a general order.

By General Order No. 376, of September 6, 1889, the Department has greatly facilitated the remittance of money by enlisted men, for the support of their families, or for savings deposit, by requiring the pay officer of each vessel in commission to keep on deposit with the assistant treasurer at New York a sufficient sum of public money upon which to make drafts.

*Naval reserves.*—I again repeat my former opinion, that the subject of speedily establishing a system of naval reserves, to meet the demands of the country, for rapidly manning and increasing its fleet upon the outbreak of war, is vitally important; and I beg to invite your favorable attention to the effort which has been made in Congress and in several of the States to effect the practicable and efficient solution of this problem.

I presented the following arguments in my report of last year :

At present no means exist for providing the fleet with a single trained man, beyond the number prescribed by law for the peace establishment, and it would seem that no argument should be necessary to secure the required legislative authority.

The study and energy of maritime nations is being devoted to placing the irremovable reserves of men, as well as materials, in such a state of training and readiness as to make them available for effective service on twenty-four hours' notice.

Rapid mobilization may be said to be the leading naval question of the day, and the recent naval maneuvers abroad have given occasion for the frequent statement of the opinion that to readiness of ships and guns must be joined an equal readiness of trained men, to make any system of mobilization complete and effective.

The bill presented by Mr. Whitthorne, of Tennessee, and known throughout the country by his name, is a carefully framed and comprehensive measure, which authorizes the enrollment of a naval militia, and the formation of a naval reserve in the several sea and lake board States, and provides Government aid in supplying arms and equipments, and facilities for training and drills.

This bill has been received with much favor, and would doubtless have passed the last Congress but for Mr. Whitthorne's serious illness. I am informed that it will again be presented, and I urge upon the Department its hearty support. Massachusetts, Rhode Island, New York, and Pennsylvania have already placed upon their statute-books laws which anticipate and supplement the provisions of this national measure.

It would be most unfortunate for the Navy and for coast defense, should Congress fail to take advantage of the favorable state of public opinion on the subject of creating a naval reserve, and pass an act to encourage, utilize, and bind together the State and individual effort, which has been made and is making, toward this end.

*Assistant Chiefs of Bureaus.*—I beg to call your attention to the desirability of legislation which shall provide for the appointment, by the Secretary of the Navy, of an assistant to the Chief of each Bureau, who shall be an officer of the Navy, of the same corps as the Chief, and shall act in his place in case of absence. A bill to this effect was introduced in the last Congress, but failed of passage. I urgently recommend such a measure in the interest of the better organization of the Department, and increased facility in the transaction of public business. The Bureau of Medicine and Surgery has now such an assistant, and the same system should be extended to the other Bureaus.

Very respectfully, your obedient servant,

J. G. WALKER,  
*Chief of Bureau.*

The SECRETARY OF THE NAVY.

ESTIMATES OF APPROPRIATION REQUIRED FOR THE SERVICE OF THE FISCAL  
YEAR ENDING JUNE 30, 1891, BY THE BUREAU OF NAVIGATION

## FOR THE SUPPORT OF THE BUREAU OF NAVIGATION.

## A.

*Salaries.*

Chief clerk (\$1,800, increase of \$450 submitted).....	\$2,250
Four clerks of class four (appropriated February 26, 1889).....	7,200
One clerk of class four* (submitted).....	1,800
Five clerks of class three† (submitted).....	8,000
Four clerks of class two‡ (submitted).....	5,600
One clerk of class one (submitted).....	1,200
One clerk at \$1,000§ (submitted).....	1,000
One copyist (submitted).....	900
One copyist (submitted).....	720
Two assistant messengers   (1 submitted).....	1,440
Two laborers.....	1,320
	<hr/> 31,430

## B.

*Salaries, Office Naval Intelligence.*

One stenographer¶ (appropriated February 26, 1889).....	\$1,600
Two clerks of class two (submitted).....	2,800
One laborer (submitted).....	600
	<hr/> 5,000

## C.

*Salaries, Office of Naval Records of the Rebellion.*

Two clerks of class four (February 26, 1889).....	\$3,600
Two clerk of class one (February 26, 1889).....	2,400
One clerk at \$1,000 (February 26, 1889).....	1,000
Four copyist's at \$720 each (February 26, 1889).....	2,880
One clerk class four (submitted).....	1,000
Two clerks class three (submitted).....	3,200
Two clerks class two (submitted).....	2,800
Four copyists at \$900 (submitted).....	3,600
One assistant messenger at \$720.....	720
For necessary traveling expenses for collection of records.....	600
	<hr/> 22,600

## D.

*I.—Salaries, Library, Navy Department.*

One clerk at \$1,000 (February 26, 1889).....	\$1,000
One assistant messenger at \$720 (February 26, 1889).....	720
One laborer at \$600.....	600
	<hr/> 2,320

\*Three previously estimated for by Secretary's office; one by Bureau Equipment and Recruiting.

†Two previously estimated for by Secretary's office; 1 by Bureau of Navigation, 1 by Bureau of Navigation (increase of \$200 submitted) and 1 by Secretary's office (increase of \$200 submitted).

‡One previously estimated for by Bureau of Equipment and Recruiting; 2 by same Bureau (increase of \$200 for each submitted and 1 by Bureau of Provisions and Clothing (increase of \$200 submitted).

§Previously estimated for by Secretary's office.

||Previously estimated for as laborer.

¶Previously estimated for by Secretary's office.

II.—*Books, Library, Navy Department.*

For professional books and periodicals.....	\$1,000
For professional books and periodicals, additional (submitted).....	1,500
	<hr/> 2,500

NOTE.—The amount estimated for (\$2,500) is that appropriated previous to the fiscal year 1885-'86. The reduced amount is inadequate to meet the necessities of the Department.

## E.

I.—*Salaries, Hydrographic Office.*

Two clerks of class two (appropriated).....	\$2,800.00
One clerk of class one (appropriated).....	1,200.00
One assistant messenger (appropriated).....	720.00
One watchman (appropriated).....	720.00
Draughtsmen, engravers, assistants, nautical experts, computers, custodian of archives, copyists, copper-plate printers, apprentices, laborers, and helpers in the Hydrographic Office.....	40,000.00
Total.....	<hr/> 45,440.00

II.—*Contingent and miscellaneous expenses.*

For copper-plates, steel-plates, chart paper, tools, instruments and material, for drawing, engraving, and printing; materials for and mounting charts; data for charts and sailing directions; reduction of charts by photography; reproduction of charts by photolithography and other processes for immediate use; electrotyping copper-plates; cleaning copper-plates, and other labor relating to chart-making; care and repairs of printing-presses, furniture, instruments, and tools; extra drawing and engraving; translating from foreign languages; expert work in compiling and arranging data for charts, sailing directions, and other nautical publications; works and periodicals relating to hydrography, marine meteorology, navigation, and surveying (appropriated).....	20,000.00
For expert marine meteorological and other work and expenses in the preparation of the Atlantic Pilot Chart and supplements, materials for and printing and mailing the same, including postage (appropriated) ..	15,000.00
For expert marine meteorological and other work and expenses in the preparation of the Pacific Pilot Chart and supplements, materials for and printing and mailing the same including postage (submitted).....	10,000.00
For rent of buildings for printing-presses, and the application of power thereto, the storage of materials and instruments used in the construction and printing of charts and other necessary purposes; repair and heating of the same, and gas, water, and telephone rates (appropriated)	4,500.00
For contingent expenses of branch offices, including furniture, fuel, lights, rent, and care of offices; car-fare and ferrriage in visiting merchant vessels, freight, express, telegrams and other necessary expenses incurred in collecting the latest information for the Pilot Chart, and other purposes for which the offices were established:	
Boston, Mass. ....	2,000.00
New York, N. Y. ....	7,500.00
Philadelphia, Pa. ....	2,000.00
Baltimore, Md. ....	1,000.00
Norfolk, Va. ....	1,000.00
Savannah, Ga. ....	1,000.00
New Orleans, La. ....	1,000.00
San Francisco, Cal. ....	3,500.00
Portland, Oregon. ....	1,000.00
	<hr/> 69,500.00
Portland, Me. (submitted).....	2,000.00
Wilmington, N. C. (submitted).....	1,500.00
Chicago, Ill. (submitted).....	3,000.00
Port Townsend, Wash. (submitted).....	1,500.00
	<hr/> 8,000.00
For continuing work on a series of charts of the coasts of Europe and Africa (submitted).....	5,000.00

III.—*For printing and binding, Hydrographic Office.*

For printing and binding for the Hydrographic Office (appropriated)..... \$28,000.00

## FOR THE NAVAL SERVICE.

I.—*Libraries of ships.*

For libraries of ships of war, professional books and papers, and drawings and engraving for signal books (March 2, 1889)..... 10,000.00

II.—*Bounties for apprentices.*

For bounties for outfits of seven hundred and fifty naval apprentices, \$45 each (March 1, 1889) ..... 33,750.00

III.—*Recruiting and transportation.*

For expenses of recruiting for the naval service; rent of rendezvous and expenses of maintaining the same; advertising for men and boys, and all other expenses attending the recruiting for the naval service, and for the transportation of enlisted men and boys at home and abroad (March 2, 1889) ..... 30,000.00

IV.—*Contingent Bureau of Navigation.*

For heating apparatus for receiving and training ships, and extra expenses thereof; for freight, telegraphing, postage on letters sent abroad, ferryage, ice, apprehension of deserters and stragglers, continuous-service certificates, good-conduct badges, and medals for boys; school books for training-ships; packing-boxes and materials; furniture, stationery, and fuel for navigation offices, and other contingent expenses and emergencies arising under cognizance of the Bureau of Navigation unforeseen and impossible to classify (March 2, 1889)..... 15,000.00

V.—*Naval training station, Coaster's Harbor Island (for apprentices).*

For dredging channels; repairs to main causeway, roads, and grounds; extending sea-wall, and the employment of such labor as may be necessary for the proper care and preservation of the same; for repairs and improvements on buildings, including the building on Coaster's Harbor Island formerly occupied by the naval war college; heating, lighting, and furniture for the same; books and stationery, freight, and other contingent expenses; purchase of food, and maintenance of live stock and wagon, and attendance on same (March 2, 1889) ..... 20,000.00

VI.—*Civil establishment, Bureau of Navigation.*

For one clerk at New York navy-yard (March 2, 1889)..... 1,400.00  
 For one master of tugs at New York navy-yard (March 2, 1889)..... 1,500.00  
 For one clerk at Mare Island navy-yard (March 2, 1889)..... 1,000.00  
3,900.00

VII.—*Purchase of farmer's house, Coaster's Harbor Island.*

For the purchase of the farmer's house on Coaster's Harbor Island, erected by W. A. Whaley at his expense under permission granted him by the Secretary of the Navy September 26, 1884 (submitted)..... 2,250.00

VIII.—*Gunnery exercises.*

For prizes for excellence in gunnery exercises and target practice; for the establishment and maintenance of targets and ranges; for hiring established ranges, and for transportation to and from ranges (submitted)..... 10,000.00

IX.—*Ocean surveys.*

For ocean surveys, the publication and care of the results thereof, determining longitudes by telegraph and the variation of the compass outside of the United States, the collection and dissemination for the Navy and merchant marine of information regarding West Indian hurricanes, and the purchase of nautical books, charts, and sailing directions (appropriated and submitted)..... \$30,000.00

X.—*Publication of surveys, Mexican and other coasts.*

For preparing and engraving on copper-plates the surveys of the Mexican coasts, and the publication of a series of charts of the coasts of Central and South America (appropriated)..... 10,000.00

## XI.—NAVAL ACADEMY.

*For pay of professors and others.*

For one professor of mathematics and one of physics, at \$2,500 each (appropriated) .....	\$5,000.00
For three professors (assistants), viz. one of chemistry, one of French and Spanish, and one of English studies, history, and law, at \$2,200 each (appropriated) .....	6,600.00
For five assistant professors, viz. one of English studies, history, and law, three of French, and one of drawing, at \$1,800 each (appropriated) ....	9,000.00
For one sword-master (\$1,500) and two assistants, at \$1,000 each (appropriated) .....	3,500.00
For one boxing-master and gymnast (appropriated) .....	1,200.00
For one assistant librarian (appropriated) .....	1,400.00
For one secretary to the Naval Academy (appropriated) .....	1,800.00
For two clerks to the Superintendent, at \$1,200 and \$1,000 respectively (appropriated) .....	2,200.00
For one clerk to the commandant of cadets .....	1,200.00
For one clerk to the paymaster (appropriated) .....	1,000.00
For one dentist (appropriated) .....	1,600.00
For one baker (appropriated) .....	600.00
For one mechanic in department of physics and chemistry (appropriated) ..	730.00
For one cook (appropriated) .....	325.50
For one messenger to the Superintendent (appropriated) .....	600.00
For one armorer (appropriated) .....	529.50
For one chief gunner's mate (appropriated) .....	469.50
For one quarter gunner (appropriated) .....	469.50
For one coxswain (appropriated) .....	469.50
For seaman in the department of seamanship (appropriated) .....	319.50
For one attendant in department of astronomy and one in the department of physics and chemistry, at \$300 each (appropriated) .....	600.00
For six attendants at recitation-rooms, library, store, chapel, and offices, at \$300 each (appropriated) .....	1,800.00
For one band-master (appropriated) .....	528.00
For twenty-one first-class musicians, at \$348 each (appropriated) .....	7,308.00
For seven second-class musicians, at \$300 .....	2,100.00
For increase of pay of professor of chemistry * (submitted) .....	300.00
For increase of pay of clerk to the paymaster † (submitted) .....	300.00
For increase of pay of armorer to present rate of pay of these grades in the naval service ‡ (submitted) .....	120.00
For increase of pay of chief gunner's mate to present rate of pay of these grades in the naval service ‡ (submitted) .....	60.00
For increase of pay of quarter gunner to present rate of pay of these grades in the naval service ‡ (submitted) .....	24.00

\* The pay of the professor of chemistry has never been sufficient to retain the services of a good chemist. The Academy has successively lost the services of three chemists, who have left to better their pay.

† The clerk for whom an increase is asked has entire charge of the accounts of the cadets. Other clerks in the same office, who have no more responsible or arduous duties, receive what is asked for this clerk.

‡ It is believed to be the intention of Congress that these men should receive the same pay as enlisted men who perform the same duty. The pay of enlisted men has been increased since the first appropriation was made for the men occupying these places at the Academy.



For pay of organist at chapel of Naval Academy * .....	\$300.00
	<u>52,421.00</u>

For special course of study and training of naval cadets, as authorized by act of Congress approved August 5, 1882 (appropriated) .....	5,000.00
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*For pay of watchmen, mechanics, and others.*

For captain of the watch and weigher, at \$2.50 per diem .....	912.50
For four watchmen, at \$2 per diem .....	2,920.00
For foreman of gas and steam heating works of Academy, at \$5 per diem .....	1,825.00
For labor at gas-works and steam buildings; for masons, carpenters, other mechanics and laborers; for care of buildings, grounds, wharves, boats, etc .....	37,864.95
For one attendant in purifying-house of gas-house, at \$1.50 per diem ....	547.50
	<u>44,069.95</u>

*For pay of employes in department of steam engineering.*

For pay of mechanics and others in department of steam engineering (appropriated) .....	\$7,824.50
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*Repairs and improvement.*

For necessary repairs of public buildings, pavements, wharves, and walls inclosing the grounds of the Naval Academy; and for improvements, repairs and furniture and fixtures (appropriated) .....	21,000.00
For furniture for cadets' quarters† (submitted) .....	7,500.00
For rebuilding gymnasium‡ (submitted) .....	25,000.00
For additional quarters for instructors § (submitted) .....	50,000.00
For paving King George Street as required by city ordinance (submitted) .....	10,000.00

*Heating and lighting Naval Academy.*

For fuel and for heating the academy and school ships (appropriated) ....	<u>17,000.00</u>
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*Contingent expenses, Naval Academy.*

For purchase of books for the library (appropriated) .....	2,000.00
For stationery, blank books, models, maps, and for text-books for use of instructors .....	2,000.00
For expenses of the Board of Visitors to the Naval Academy; being for mileage and \$5 per diem for each member .....	1,500.00
For purchase of chemicals, apparatus, and instruments in the department of physics and chemistry, and for repairs of same .....	2,500.00
For purchase of gas and steam machinery: steam pipe and fittings; rent of buildings for use of the Academy; freight, cartage, water, music, musical and astronomical instruments; uniforms for the bandmen, telegraphing; for feed and maintenance of teams; for current expenses and repairs of all kinds and for incidental labor and expenses not applicable to any other appropriation (appropriated) .....	<u>32,000.00</u>

\* The organ in the Academy chapel was purchased many years since by the officers and cadets and has been kept in repair by them. The organist has always been paid by a monthly tax upon the officers and cadets. It is thought proper that the services of the organist should be provided for by an appropriation.

† Ten thousand dollars was asked for this purpose one year since: \$2,500 was appropriated. The balance of the furniture required can be purchased to best advantage to the Government if the balance of the money is appropriated at once.

‡ The gymnasium is a temporary wooden structure surmounting old Fort Severn. While it was never well suited for the purpose, it is now so entirely worn out after nearly forty years of service that it must be rebuilt. It is proposed to rebuild upon the old fort, preserving the historical portion of the present gymnasium. The building to be of wood and iron.

§ The quarters for officers and instructors are not nearly sufficient; at present there are twenty who are married and have no quarters. As these officers are the juniors who have the least pay, they are the least able to bear the additional expense. It is proposed to build ten small houses, which would in a great degree remedy the difficulty.

For stores in department of steam engineering and materials for repairs in steam-machinery .....	\$1,800.00
	<hr/>
	41,800.00
	<hr/>

## RECAPITULATION—NAVAL ACADEMY.

Appropriated:	
For pay of professors and others .....	\$51,319.00
For special course of study .....	5,000.00
For pay of watchman, mechanics, and others .....	44,069.95
For pay of employes department of steam engineering .....	7,824.50
For repairs and improvements .....	21,000.00
For fuel and for heating Academy and School ships .....	17,000.00
For contingent expenses Naval Academy .....	41,800.00
	<hr/>
	188,013.45
Submitted:	
For increase of pay (under pay of professors and others) .....	1,104.00
For furniture for cadets, quarters (under repairs, etc.) .....	7,500.00
For rebuilding gymnasium (under repairs, etc.) .....	25,000.00
For paving King George street (under repairs, etc.) .....	10,000.00
For additional quarters for instructors .....	50,000.00
	<hr/>
Total .....	281,617.45

## RECAPITULATION.

## FOR THE SUPPORT OF THE BUREAU OF NAVIGATION.

A.— I. Salaries, Bureau Navigation .....	\$31,430.00
B.— I. Salaries, Office Naval Intelligence .....	5,060.00
C.— I. Salaries, Office Naval Records of the Rebellion .....	22,600.00
D.— I. Salaries, Library Navy Department .....	2,330.00
II. Books, Library Navy Department .....	2,500.00
E.— I. Salaries, Hydrographic Office .....	45,440.00
II. Contingent and miscellaneous expenses .....	82,500.00
III. Printing and binding, Hydrographic Office .....	28,000.00
	<hr/>
Total .....	219,910.00

## FOR THE NAVAL SERVICE.

I. Libraries of ships .....	10,000.00
II. Bounties for apprentices .....	33,750.00
III. Recruiting and transportation .....	30,000.00
IV. Contingent, Bureau Navigation .....	15,000.00
V. Naval training station .....	20,000.00
VI. Civil establishment .....	3,900.00
VII. Purchase of farmer's house .....	2,250.00
VIII. Gunnery exercise .....	10,000.00
IX. Ocean surveys .....	30,000.00
X. Publication of surveys .....	10,000.00
XI. Naval Academy .....	281,617.45
	<hr/>
Total .....	446,517.45

## Statement of the amounts expended at the different navy-yards under appropriation "Civil establishment, 1888-'89" (third section, act January 30, 1885).

Portsmouth .....	\$1,000.00
New York .....	4,730.97
Washington .....	999.99
Norfolk .....	1,150.67
Mare Island .....	1,000.00
Naval War College .....	250.00
	<hr/>
Total .....	9,131.63

## REPORT OF THE SUPERINTENDENT OF COMPASSES.

NAVY DEPARTMENT, BUREAU OF NAVIGATION,  
OFFICE OF THE SUPERINTENDENT OF COMPASSES,

July 1, 1889.

SIR: I have the honor to submit the following report for the year ending June 30, 1889.

Ten  $7\frac{1}{2}$ -inch navy compasses, eight tell-tale compasses, seventy-one boat compasses, and thirteen azimuth circles were repaired.

The following-named instruments were purchased, viz: ten compensating binnacles, four horizontal circles for observing vibrations of a magnetic needle, four vertical-force instruments, six ship's clinometers, and eight peloruses. Twelve copies of "Practical Guide for Compensation of Compasses without Bearings" (Collet) were also purchased. This book contains a description of the use of Thomson's vertical-force instrument, and is therefore supplied to all ships whose compasses are compensated. It should be added to the list of library books issued to steel or iron vessels.

Owing to the exhaustion of the appropriation for instruments pertaining to this office, the repairing of a lot of compasses examined in the Boston yard had to be deferred until the next fiscal year.

In ordering the Thomson vertical-force instruments I have suggested to the makers the introduction of an inclined scale at both ends of the instrument, instead of making them with one only, as heretofore. This was done in order to avoid the necessity of reversing the magnetism of the dipping needle or the reversal of the needle itself (which would necessitate the dismounting of the instrument) whenever a vessel using it crosses the magnetic equator.

Compensating binnacles of the new pattern have been issued to the *Yorktown*, the only vessel requiring them this year. Others are ready to be put on board of the steel vessels as soon as they shall need them.

The compasses of the *Yorktown* were compensated while she was in the dock at Philadelphia, preparatory to her passage to New York.

Magnetic surveys were made of the *Chicago*, *Boston*, and *Yorktown* while in the Brooklyn dry-dock. A drawing showing the magnetic forces of the *Yorktown* is appended to this report. The *Chicago* and *Yorktown* before proceeding on a cruise should be swung at the compass buoys. Neither vessel has yet been swung for a complete table of deviations.

Observations for magnetic forces, horizontal and vertical, have been twice made on board the *Petrel* at Baltimore and the best place for her standard compass determined. It is the intention to supply this vessel with one compensating binnacle for her standard compass. She has only a large hand-wheel for steering and will require two ordinary steering binnacles. It is thought that these two compasses may be conveniently compensated by fore-and-aft and athwartship magnets placed on the deck. Magnets of sufficient power to accomplish this are now being made.

In this connection I would state that experience in making observations for magnetic forces on board our steel vessels leads me to believe that no reliable data can be gathered unless the vessel is in dry-dock. A vessel while in the water always has more or less motion. This is, of course, quickly detected when using magnetic instruments on board. The motion of the vessel is especially noticeable when using the dipping needle for the determination of the vertical force. I call attention to

this fact because it has been the practice to undertake these observations even while a vessel was not in dock. Observations were made for years with delicate magnetometers on board ship in Arctic expeditions until Weyprecht, after himself trying it, called attention to the uselessness of the attempts.

In future orders for binnacles it is intended to make a change in the hood and the lanterns. A lantern has been designed in which, by means of lenses, the light from the lamps is concentrated on the keel mark of the compass bowl. The light is thrown where it is needed, and only there. A small arc of the compass card is visible and the illumination of the immediate neighborhood of the binnacle is avoided.

One set of these lamps has been tried on board the *Yorktown*, and, though not yet fully tested at sea, the commanding officer of that vessel has made a report favorable to them.

Trials with an incandescent lamp were made in this office a year ago with a view of ascertaining the desirability of lighting binnacles, by means of electricity. Although this would be recommended on the ground of cleanliness, convenience, and the avoidance of the trouble of keeping the oil lamps alight, especially in high winds, it was found that by bringing the lamp close to the compass of standard navy size a deflection of the needles could be produced. Notwithstanding that this was very small it was deemed best to order oil lamps for the new binnacles, upon the general principle that no avoidable error, even when capable of exact measurement, should be allowed in the compass reading.

This suggests a reference to the deflections produced on the compass needles by the dynamos for electric lighting purposes now being placed in all the new ships, and a recommendation that the position of the dynamos should be a secondary consideration to that of the compasses. Generally speaking, the best places for the compasses can be foretold, because in addition to a favorable magnetic field the standard compass must be so placed, usually on a bridge or the poop-deck, that bearings may be conveniently and quickly observed. There is little or no danger from the current in the wires with the two wire system used in the service, even when the wires are close to the binnacle, unless, of course, there is faulty insulation.

As far back as 1885 public attention was called in England to the effects of the electric current in ships on the compasses. About 40 feet was then considered a safe distance between dynamos and compasses. Cases were mentioned where so little attention had been paid to this subject that dynamos were actually placed from 13 to 14 feet from the standard compass.

Of course, when a lighting plant has once been placed in a ship it is difficult and costly to change the position of the machine.

In speaking of safe distance, that is, the distance at which no error can be observed, the induction of magnetism in bulk-heads and other vertical as well as horizontal steel or iron must not be overlooked.

The case of the *Chicago*, mentioned in my last annual report, is illustrated in the accompanying sketch marked A.

The after bulk-head of the engine-room trunk runs up to the spar-deck, and though it is never well to place a compass near a bulk-head, in this case considerations mentioned above rendered the bridge the best position for the standard. It can not be moved forward, and if moved abaft the nest of boats on the quarter-deck the proximity of the steel mizzen mast would cause trouble, even if the strong vertical force in this position were left out of consideration.

The standard compass of the *Chicago* has now been raised on a bell-shaped pedestal, in order to reduce the deflections produced when the dynamo is in operation and also to obtain a clear view over the vessel stowed on board and the search-light pedestals flanking the compass at either end of the bridge. To raise it higher would be inconvenient. However, if this is done a length of bronze chain would have to be attached to the wire stay over the compass.

The annexed table marked B is a record of the observations made for the purpose of ascertaining the deflections of the compass needle caused by the dynamos while the vessel was in dry-dock in January of this year.

A table annexed and marked C shows the effect of the light plant of the U. S. S. *Omaha* (a wooden vessel) on the direction of the compass needles. These observations were made on August 11, 1889. The steering compasses only are affected.

While making observations for magnetic force on board the U. S. S. *Yorktown* in dry-dock, navy-yard, Brooklyn, N. Y., June, 1889, the deflections of the needles of the wheel-house compass were noticed. When the dynamo stopped, the reading of the compass heading was  $S. 7^{\circ} 15' W.$ ; one dynamo running, the reading was  $S. 8^{\circ} W.$ , a deviation of  $45'$  from  $28^{\circ} 15' E.$  to  $27^{\circ} 30' E.$

A sketch of the relative positions of the wheel-house compass and the dynamos is appended, marked D.

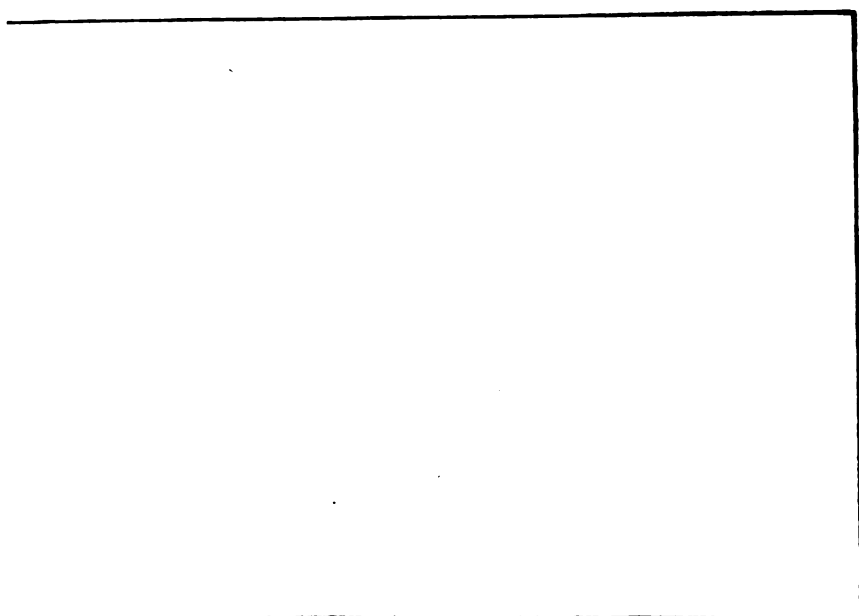
Trials should be made with the new marine dynamo to determine the safe distance at which it would be advisable to place the compass.

It is also well at this time to call attention to the compass deflections which will probably arise from the use of electric motors, should they be introduced into our ships. It is difficult in most cases to place compasses on board without having them near some part of the battery. Should electric motors be used for training the guns in the immediate neighborhood of the compasses, the error due to this will of course only exist at the time when the guns' crews are drilling, and hence, being neither continuous nor constant, yet an additional table of deviation will be required.

Even if the error, when it can be accurately determined, as it is claimed that it can be, is constant, it occasions extra work and introduces complications entirely unwarranted. With the compensating binnacle now used, generally speaking, two complete sets of observations are necessary—the first to determine the deviation table, and a second, after compensation, for the purpose of observing the residual deviations. If errors are now introduced by the dynamos or motors swinging more, at least, will be necessary to determine the deviations, even should they be constant.

If we consider that besides these errors the deviations are also affected by the retentive magnetism of the ship, it seems highly advisable to further complicate the problem. The very fact that the compass is so convenient and customary for navigators to observe the sun for position errors might cause any change of error during the night to go unsuspected, or even if not unsuspected it would be difficult to correct it with the instruments supplied to ships.

The only safe plan in using the mariner's compass, the most important instrument of navigation, and one requiring close and constant attention, is to eliminate all avoidable errors, even when they can be correctly applied. The additional security given to the navigation compass demands this. With this end in view the most favorable po-





to give satisfaction. The wiring of the ship has been completely renovated, and many improvements made in the locations of lamps, fixtures, etc., by the officer in charge, Lieut. J. B. Murdock, U. S. Navy. All work of this kind has been performed by the seamen gunners on board, the necessary materials having been forwarded from the United States. The arc light supplied has been frequently used with great satisfaction for coaling ship at night. The lamps of the Sawyer-Man pattern in use on board in many instances have shown a remarkably long life, several having a record of from 5,000 to 7,000 hours each. The necessity for the use of a separator has been made very apparent, water having frequently flooded the cylinder of the dynamo engine, particularly when the ship has been anchored in the rivers of China, where the water is very muddy.

Lieutenant Murdock, under the direction of the commanding officer of the *Omaha*, has conducted some very interesting experiments in reference to the use of signals by means of electric lamps. The regulation red and green signal lanterns were fitted with 16-candle-power lamps and the necessary apparatus for opening and closing their circuits. The current was kept on from two to five seconds, and the various combinations necessary to represent different figures were easily read by an officer stationed three-fourths of a mile distant. It was estimated that with a proper separation of these lamps these combinations could be read at a distance of 2 miles. It was thought on board that if 32-candle-power lamps were used, these combinations could be read at a distance of from 4 to 5 miles. A message requiring the use of twelve stars of the Very system was made in thirty seconds.

As on board of the *Trenton* when attached to the Asiatic Station, the great benefit of electric lights on board of the *Omaha*, particularly when in the very warm and humid climate of this Station, is much appreciated and frequently testified to by the officers and men of the ship.

*New Hampshire.*—The plant of this ship, located on shore at the U. S. Naval Training Station, is reported to be somewhat out of order. The commanding officer of the Training Station has requested that a representative from this office should inspect the entire installation; this inspection has not yet been made. From the quarterly reports it is evident that the entire plant should be renovated and put in thorough condition. It is probable that when this is done it will be advisable on the score of efficiency and economy to arrange a small central station for supplying light not only to this ship, but to all buildings of the Training Station, located on Goat Island, also the necessary street lamps.

*Dolphin.*—The plant of this ship is badly located, being on the berth-deck. On account of the heat radiated from the engine and steam-pipes, and the noise caused while in operation, the plant is not kept in operation during warm weather. The insulation of the conductors at present on board is very inferior. When this ship is overhauled and repaired, the location of the lighting plant should be changed and the entire installation overhauled. The present plant should be replaced by a modern one that can be used to operate a search light and which is more efficient and satisfactory.

*Atlanta.*—The plant of this ship continues to be very serviceable, although of the old style belted type. Some difficulty has been experienced when at sea, with a list on the ship, in keeping belts on when the latter are much worn and greasy. No serious difficulty of this kind has been encountered, however. Some faults have occasionally oc-



curred in the insulation of the conductors, but nothing to prevent the running of the plant. When in port it has frequently been run continuously for a period of one week. Improvements have been made in the connections of running lights and other fixtures in exposed positions, suggested by experience and the very intelligent supervision by the officer in charge. During the past year a number of Sawyer-Man lamps have been supplied to this ship for use, and although the expenditure is still larger than in its sister ship, the *Boston*, the average lifetime is good, both of the Sawyer-Man and Weston type. When it becomes necessary to keep this ship at a navy-yard a sufficiently long time for repairs, the present plant should be replaced by a modern one, with the engine and dynamo connected to the same shaft.

*Boston.*—The plant of this ship has been described in previous reports. It has continued during the past year to be largely experimental. The second plant installed, briefly referred to in last year's report, was completed September 29, 1888. After being thoroughly tried, both by the officer in charge on board ship and representatives of the Brush Company, it was pronounced to be inefficient, and therefore it was not accepted by the Government.

The difficulties with the plant may be summarized as follows :

The armature was not sufficiently secured to the shaft, and at times worked loose. The thrust collars in the bearings were not sufficient to prevent longitudinal movement of the armature when at sea with the ship rolling; at such times the armature would strike against the pole pieces. The dynamo sparked less than its predecessor, and in this respect was an improvement, but it did not keep up its electro motive force. The cast-iron gear-wheel of the engine and the rawhide pinion of the dynamo shaft both showed a tendency to work loose. The plant proved to be too noisy for ship use. Trouble was also experienced in getting water into the engine cylinders, particularly when the boilers were forced, and the need of a separator and reducing valve became apparent. The engine did not govern well on account of the fly-wheel being too light. This was the first engine of the type introduced on board ship for running a dynamo, and the need of a heavier wheel was ascertained by the makers, and in the next engine this difficulty was overcome.

No. 2 dynamo was taken out in December, 1888. No. 3 dynamo was installed in March, 1889, and the following changes were made in the plant: A separator and reducing valve were introduced into the steam piping. As it was impracticable to use a heavier governor-wheel on account of space, a new gear-wheel, weighing 200 pounds more than the old one, was procured. The new No. 3 dynamo was made with longer commutator bars and wider brushes, in order to decrease sparking. The amount of copper in the armature winding was considerably increased in order to decrease heating. The longitudinal thrust was taken up by means of collars on the shaft, which were adjustable, with a washer between the collar and the shaft bearings. The Babbitt-metal in the bearing was turned over as a bearing for the washer; the collars were adjustable by means of a screw thread on the shaft. An improved bed-plate was also procured. The third plant was ready for trial on the 20th of April, 1889, and after about two months' experiments with it the following results were obtained: The adjustable collars for preventing the armature from striking the pole pieces were found to heat badly, quickly wearing away the Babbitt-metal. It was found impossible to prevent the armature from striking the pole pieces. The latter were then planed down one-sixteenth of an inch on each; after this was

done it was found that the electro-motive force, as expected, was decreased from 92 volts down to about 85. To overcome this the engine was speeded up to about 450 revolutions, this being 50 revolutions more than was originally designed. Even with this increased speed the electro-motive force is rarely up to its normal, averaging about 88. The heavy gear-wheel improved the running of the engine very much, the revolutions now being regular and the noise very much decreased. The separator and reducing valve perform the work intended and give great satisfaction.

During all these experiments the Brush Company has exhibited much patience and liberality in expenditure. This company is now just completing the fourth dynamo for the ship, which will be installed at once; it is promised to be of an improved design for incandescent work, with a regular screw propeller thrust-bearing. It is hoped that this will give satisfaction in every respect, no dynamo having as yet been accepted by the Department. The general design of the Brush machine is one which may be expected to give trouble on board ship when the latter is pitching and rolling, on account of the very small clearance between the armature and pole pieces. It is hoped, however, that with the new thrust-bearing this will be overcome. All the experimental work with the electric-lighting plant on board this ship has been under the supervision of Lieut. C. G. Bowman, U. S. Navy, who has shown great zeal and efficiency in prosecuting it.

*Chicago.*—The installation of this ship was completed in May, 1888. It is briefly described in the report from this office for that year. Since its completion it has operated constantly with satisfaction in every respect until very recently. The insulation of the armature of one machine, also the insulation of one of the field coils of the other machine, became so much impaired that there was danger in operating the dynamo, and necessitated rewinding both. These repairs have been effected at moderate cost, and the plant is now in good order. They were probably caused by the fact that the engines are located on a framework immediately above the dynamos, and it is considered probable that moisture from the engines and their attachments was the cause of the difficulty in the insulation. The space devoted in this ship to the electric plant is so small that it is impossible to install a plant of the output of the present type unless it is arranged as this is or with gearing or friction wheels. Recently new and improved fixtures have been placed in the cabins, ward room, and on the half-decks. No trouble is anticipated in the future, unless it is from the cause already alluded to, which it is thought may, with care, be avoided.

The engines of this plant, although of the commercial belted type, perform in a very satisfactory manner, and will run the dynamos with full load, atmospheric exhaust, with 40 pounds of steam. The ship is well supplied with stores for a three years' cruise.

*Yoriktown.*—The installation of this ship was briefly described in my report of last year; since then it has been completed. The general character of the plant, consisting of two units in every way the same, is shown in Plate 1. It consists of two engines and two dynamos, each being a counterpart of the other, thus permitting the interchange of spare parts. The dynamos are of the Edison type, compound wound and multipolar, making 400 revolutions per minute, and of 80 volts and 100 amperes. They have a commercial efficiency of 83 per cent. They also have 4.32 watts output per pound of metal not including the bed-plate, and 3.64 watts output per pound of metal including bed-plate. No part of their circuit heats over 40° Fahr. above the temperature of the

surrounding air after being run four hours with a full load. The directly connected to the engine by means of a Brotherhood flexible coupling. The engines are Armington & Sims' horizontal, doubling, with two cylinders, each 7 by 5 inches, and weighing 2,230 pounds. They will drive the dynamos at full load with steam pressure pounds, atmospheric exhaust, cutting off at one-fourth; by following further, they can be used at considerably lower pressure. The variation in speed of these engines, when going suddenly from no to full load, is about six revolutions.

Total weight of one plant, consisting of engine, dynamo, and combination bed-plate .....  
The ship foundation for the bed-plate, consisting of solid wood .....

Total weight of one plant .....

Weight of both plants .....  
Weight of all other materials in connection with the installation, including stores when ready for sea, such as oil, etc., and steam-piping, oil-tanks, wire, fixtures, etc. ....

Total weight of installation .....

The total number of lamps installed on board is 234; of these 1 of 10-candle power, 86 of 16-candle power, 14 of 32-candle power.

Many improvements were introduced in the installation of this ship over that of the *Chicago*, and it is the first one to have a plant with engine and dynamo directly connected. The switch-board is and all junction-boxes and most of the switches and fixtures are watertight. It is thought that the accidents arising from the presence of water on conducting metal or from fire are reduced to a minimum on this ship. The vessel was commissioned in February last, since which time a dynamo has been almost constantly in operation. The character of the installation has given great satisfaction to those on board. The dynamo-room, which is located below the armored deck, is ventilated by means of a Blackman fan driven by an electric motor. The ventilation is reported to be excellent.

The inspector of the installation, located at the works of the bureau was Lieut. T. E. De Witt Veeder, U. S. Navy, to whose thorough interest in the work the success of the plant is due.

*Baltimore.*—The installation of this ship is about being complete, a few minor details only requiring to be finished. The lights have all been used during her trial trips and at other times when necessary, and they promise great efficiency. The plant, the general character of which is shown in plate 1, consists of three units, identical in every respect. Each unit is made up of one Edison compound wound multipolar dynamo, of 80 volts and 200 amperes, connected by means of a Brotherhood flexible coupling to an Armington & Sims' horizontal, doubling engine, with two cylinders, each 7 by 5 inches. The dynamos run 1,800 revolutions per minute, and have a commercial efficiency of 86 per cent. Each watt output per pound of metal, including dynamo bed-plate. No part of the circuit of either dynamo heated more than 10° above the temperature of the testing-room after a trial of four hours with full load. The insulation of all parts is over one megohm. The engines will drive the dynamos at full load with a steam pressure of 100 pounds, atmospheric exhaust, one-fourth cut-off. They govern speed closely, generally within 1 per cent., during any ordinary change of load.

The details of the installation are very similar to those of

*town*, a few improvements suggested by experience having been made. The number of lights installed is 451, consisting of 262 of 10 candle-power, 176 of 16 candle-power, 8 of 32 candle-power, and 5 of 50 candle-power.

	Pounds.
Total weight of one unit, consisting of dynamo, engine, and combination bed-plate .....	6,743
Weight of the ship foundation for the bed-plate, consisting of steel-plates with a wooden top for insulating purposes .....	1,236
Total weight of the three plants .....	23,937

Some of the fixtures are much improved over those of the *Yorktown*. The work of installing this ship has also been under the supervision of Lieutenant Veeder, U. S. Navy, as resident inspector, and to his efficient aid the excellence of the plant is due.

*Charleston*.—The electric-lighting plant of this ship, with the exception of a few minor details, has been completed. It consists of three dynamos of the same pattern as those used on board the *Baltimore*. Two of these dynamos are directly connected by means of flexible couplings to two vertical compound engines of the Allan type, constructed at the Union Iron Works, San Francisco, Cal. The general character of these two units is shown in plate 2. The third dynamo is connected to an engine similar to those used on board the *Baltimore*, and is shown in Plate 1. This became necessary on account of the decreased vertical space in the dynamo-room, caused by the slope of the armored deck, and will afford a good opportunity to test the relative merits of the two types of engines for running dynamos.

The specifications and requirements of the installation of the *Baltimore* served as a guide for that of the *Charleston*, and most of the fittings are precisely similar. The tests thus far of the installation of the *Charleston* have been very successful, and during her recent speed trial it was declared that it would have been impossible to have run at such a high rate of speed without electric lights in the engine and fire rooms. The total number of lamps installed is 440, consisting of 168 of 10 candle power, 251 of 16-candle power, and 21 of 32-candle power. The total weight of the three plants, including engines, dynamos, and bed-plates, is 23,699 pounds. Most of the materials for the installation were procured from The Edison United Manufacturing Company, and were inspected in New York previous to shipping them to California. The installation of the ship at the Union Iron Works, San Francisco, Cal., has been under the direction of Lieut. A. W. Grant, U. S. Navy, who has shown great zeal, intelligence, and skill in prosecuting the work.

*Pensacola*.—The installation of this ship, referred to in my last report, has been completed, though subject to many delays on account of repairs on the ship having been interrupted. A single plant only has been placed on board, and this is in every respect similar to one of the units installed in the *Baltimore*, and shown in plate 1. With the exception of some defective insulation, the plant is now all ready for service. The total number of lamps installed is 270, consisting of 148 of 10-candle power, 121 of 16-candle power, and 1 of 32-candle power. The installation has been completed under the local supervision of Lieut. Lucian Flynn, U. S. Navy. Many difficulties were encountered by him on account of the ship having been sunk in the dry-dock while the installation was partially finished, doing much damage to various parts. Among the difficulties was one of considerable interest, namely, the fact that the porcelain blocks used in the junction boxes absorbed so much salt water that after the water was evaporated the deposit of

salt remaining was the cause of very inferior insulation. This eventually overcome by boiling the porcelain blocks in fresh water afterward in paraffine.

*Philadelphia.*—The builders of this ship, Messrs. William Cran Sons, Philadelphia, Pa., have sublet the installation of electric li to the United Edison Manufacturing Company, 65 Fifth avenue, York. The fixtures will be supplied by Messrs. Williams, Page & 24 Beach street, Boston, Mass. The work has already been comm The installation will practically be similar to that of the *Baltic* with some few modifications and improvements suggested by ex ence.

*San Francisco.*—This ship will have an installation consisting of 1 Edison compound wound, multipolar dynamos of 80 volts and 200 peres each, driven by Allan compound vertical engines. The ge type of each unit is shown in plate 2. The work of installing the 1 has not commenced, as the ship has not been launched. The deta the installation, however, have been completed, and much of the mat manufactured.

*Concord and Bennington.*—These two ships are practically the 1 as the *Yorktown*, and are being constructed by Messrs. N. F. Pal jr. & Co., at Chester, Pa. The builders have sublet the electric in ation to the United Edison Manufacturing Company. Two dyn and engines similar to those supplied to the *Yorktown* will be furni to each ship. The general character of the entire installation wi similar to that of the *Yorktown*, with perhaps some minor improv suggested by experience on board of the latter vessel since she has commissioned.

*Petrel.*—It was not originally intended to place electric lights on b this vessel. The expediency of lighting small ships by electricity discussed in my report for 1887. As an appropriation was made Congress for installing this vessel, a contract has been entered int tween the Department and the Thomson-Houston Electric Compan Boston, Mass., for that purpose. The vessel will be supplied with units, each consisting of a dynamo of 80 volts and 50 amperes, ma 500 revolutions per minute, directly connected to an Armington & vertical simple engine, with two cylinders, each 5 by 3 inches. The eral character of this plant is shown in plate 3. It is expected tha unit will be ample for supplying incandescent lights, and the remai unit will supply current for one powerful search-light. The weigl the engines, dynamos, and bed-plates complete is limited to 6,000 poi The contract was made on specifications carefully drawn in great d and the work of installation will begin as soon as the ship has bee livered to the Department by the contractors. It is confidently a pated that a superior plant will be installed.

*Vesuvius.*—An appropriation also having been made for installin *Vesuvius* with electric lights, a contract was entered into with the T son-Houston Electric Company, of Boston, Mass., at the same tin that for installing the *Petrel*. Her plant will be a single unit, simil the units supplied to the *Petrel*. This may be used both for a search-of minor power and for a certain number of incandescent lights found necessary, a smaller plant may be installed later for wor search lights alone. Work on this installation, as in the case of *Petrel*, will be commenced as soon as the vessel has been accepte the Department.

*Vermont.*—Six thousand dollars, available after the 1st of last, was appropriated by the last Congress for the installation of ele

lights on board of the receiving-ship *Vermont*. Some delay has been occasioned in commencing the work, on account of changes in the location of the boiler-house recommended by the Board on Permanent Improvements in the New York navy-yard. At present, however, the site of the new boiler-house has been determined upon, also, in connection with it, the dynamo-room, and the work of building the house is in progress. It is proposed to locate the dynamo and engine on the cob-dock. Both will be of the ordinary commercial pattern and connected by means of a belt. It is proposed to install a dynamo with a capacity of about 300 16-candle-power lamps. A boiler for driving the engine has been provided by the Bureau of Steam Engineering, and is one formerly used at the Washington navy-yard for experimental purposes. Specifications for a contract have been prepared, and advertisements for proposals will be issued in a few days. It is intended to light up Sailors' Hall, as well as other buildings on the cob-dock, in addition to lighting the *Vermont*. The electric lights will add much to the comfort and convenience of all quartered on board the receiving-ship, averaging from three hundred to four hundred people, as well as improving very greatly the provisions for the proper police of a recruiting depot.

*Miantonomoh*.—This ship is now in a condition to receive her electric-lighting plant, and specifications for a contract are nearly ready for issue. It is proposed to install on board two dynamos, both of 80 volts, one of 400 amperes and the other of 200, each driven by a separate engine. It is thought that these will furnish sufficient current for incandescent and search lights, and also for any power motors that may be required.

#### ELECTRIC CONDUCTORS IN SHIPS.

All electric conductors on shipboard are now subject to the supervision and direction of the Bureau of Equipment and Recruiting, and directly under the control of this office as a part of that Bureau. All wires will now be run on board ship under the supervision of the same officer, and will be kept separate and distinct, each being arranged so as to permit of the greatest efficiency. The consolidation of the labor of installing all electrical apparatus and appliances was brought about by General Order No. 372, dated June 25, 1889. In addition to the directions contained in that order, the following specific detailed instructions on the subject were given :

NAVY DEPARTMENT, *July 9, 1889.*

SIR: As an explanation of the intentions of the Department, briefly expressed in General Order No. 372, you are informed that all electric search-light apparatus is now under the cognizance of the Bureau of Equipment and Recruiting. You will, therefore, supply that Bureau, as early as possible, with a detailed statement of the present condition and location of all apparatus of that kind on hand or contracted for; also any information concerning it that will be of assistance to the Bureau of Equipment and Recruiting in preparing the outfits of ships, particularly the new cruisers.

You are also informed that the installation of all electric conductors on shipboard, for whatever purpose required, is under the control of the Bureau of Equipment and Recruiting, and subject to the immediate superintendence of the Naval Inspector of Electric Lighting or his representative. You will, therefore, in ample season, indicate to that Bureau what conductors of this nature will be required by your Bureau, in order that all wiring of ships may be laid out and proceeded with systematically and at the same time.

Very respectfully,

B. F. TRACY,  
*Secretary of the Navy.*

Commodore M. SICARD, U. S. Navy,  
*Chief of the Bureau of Ordnance.*

NAVY DEPARTMENT, July 9, 188

SIR: You are informed that the installation of all electrical apparatus in any connected with the interior communication of ships will be under the control of Bureau of Equipment and Recruiting and laid out and installed under the immediate supervision of the Naval Inspector of Electric Lighting or one of his representatives though included, as heretofore, in the hull specifications. You will also consult Bureau of Equipment and Recruiting as to the location of all other means of interior communication, such as voice pipes, etc.

Very respectfully,

B. F. TRACY,  
*Secretary of the Navy*

Chief Constructor T. D. WILSON, U. S. Navy,  
*Chief of the Bureau of Construction and Repair.*

As at present the entire equipment of a ship is also under the direction of the Bureau of Equipment and Recruiting, the presence of an executive officer at the various ship-building works where Government vessels are being constructed will render his services very useful in arranging matters or in deciding many questions of importance in connection with berthing, messing, and stationing the crew, also in arranging for proper stowage of material, and numerous other duties with which executive officers only are familiar with. Many questions of this character have come before my notice since I have been connected with the installation of the electric appliances on board the new ships, and I believe it a matter of great importance to have a proper consultation between the various officers, representing different corps, who are supervising the construction of the new types of war vessels.

#### SEARCH-LIGHTS.

The Bureau of Equipment and Recruiting has been informed by the Bureau of Ordnance that a search-light outfit for most of the new ships has been contracted for. They are to be supplied by the Thomas Houston Electric Company, of Boston, Mass. What further search-light material is on hand has not yet been ascertained. Two projectors only have been turned over to the Bureau of Equipment and Recruiting, and are being installed on board of the *Yorktown*. Those for other cruisers which are about completed, such as the *Baltimore* and *Charleston*, have not yet been received, although their installation should be completed at the present day. It is proposed hereafter soon as the requisite material can be obtained, to install search-lights at the same time that other electrical appliances are installed. They will then be ready for trial when the ship is finally accepted. No single ship has been installed with search-lights during the past year.

It is the opinion of naval experts generally that search-lights are very important for use on board ships of any considerable size, and a vessel of war is now complete without them, ranging in number from one ship from one to twelve. The senior officers of the Italian navy are so impressed with the importance of locating the search-lights low down near the surface of the water that their largest and most important ships are provided with a double tier of projectors. Those on the lower tier are operated through water-tight doors, and are so low that they can not be used in a sea way, being then withdrawn and the doors closed. It is sometimes difficult to find a place for the projectors where they will be clear of the fire from the main and secondary batteries. For this reason the tendency has been to elevate them and place them on top of pilot-houses, in tops, and other high localities. I regard this as very unwise, and consider that ports should be provided for them

under the fore-castle and in after-cabins in ships provided with fore-castle and poop-decks. Under any circumstances provision should be made for their location in designing a ship, rather than to pursue a policy of finding a place after the ship has been finished.

It has been the custom recently to install search-lights of minor power or board torpedo-boats, and even sometimes in ships' launches. Recent experience with torpedo-boats among the Continental powers indicates that these lights can not be used to any advantage; the boats are so lively in their movements that it is impossible to keep the rays of the search-light on any one point, and the general result is that they simply advertise the locality of the boat itself. Small plants for incandescent lights, however, are very important in rendering torpedo-boats habitable.

#### ELECTRIC-LIGHTING INSTALLATIONS AT NAVY-YARDS AND NAVAL STATIONS.

Sixty thousand dollars was appropriated by the last Congress to inaugurate a system of electric lighting at the navy-yards at New York; Norfolk, Va.; Washington, D. C.; and Mare Island, Cal. This appropriation is under the cognizance of the Bureau of Yards and Docks, but the specifications for installing the lighting plants, the supervision of the work, and other technical matters connected with it are performed in this office. A contract has been made with the Brush Electric Company, of Cleveland, Ohio, for the installation of two engines and four dynamos, also ninety-seven arc lamps, with all the necessary appurtenances and fittings of a central station. Work has just been commenced on the plant. It is proposed, when the entire system is complete, to have a plant capable of operating one-hundred and eighty 2,000-candle-power arc lamps, and one thousand two hundred 16-candle-power incandescent lamps. Twenty-two of the present installation of arc lamps are intended for outside lighting, and seventy-five for lighting the interior of the ordnance shops.

Specifications have been prepared for the inauguration of a central station at the navy-yard, New York. It is proposed to begin here also with arc lights, their presence for police purposes being considered the most important. It is designed to have at the New York central station, when completed, a plant with a capacity for two hundred and forty 2,000-candle-power arc lamps, and two thousand four hundred 16-candle-power incandescent lamps. The work of beginning this installation has been delayed by settling upon the proper building or site for the central station; this has been recently decided, and active steps will be taken at once to make a contract for the first installment of the necessary plant.

The remaining navy-yards, at Norfolk, Va., and Mare Island, Cal., have been studied with a view of locating the necessary lights, and as soon as it is determined where to locate the central station, and the building prepared, the specifications will be ready for issue. The lighting plant in all instances at navy-yards will be capable of being used as a power plant during the daytime when power in detached places is desired. A small dynamo has been installed in the New York navy-yard already, which is used for the purpose of running drills and other small power tools, and the use of electricity for such purposes promises to be very successful. It is not economical for large motors which can be conveniently run by steam; but for small motors, which are located



at distant points from the steam supply, electricity is not only economical, but a very useful agent. When the central station at the New York navy-yard is complete, it will not only afford a very much improved system of lighting, both economical and very efficient; but it will enable night-work to be performed on occasions of any emergency, add greatly to the efficiency of the police of the yard, and enable work to be performed in the interior part of the new ships by furnishing both light and power much better than can be performed in any other possible manner. I beg to call attention to this most important subject, and to express the opinion that it will aid the work of building up a new Navy very much, if appropriations are made to complete the lighting plants at the navy-yards as projected and already inaugurated.

#### RECEIVING-SHIPS.

In former reports it has been urged that receiving-ships should be installed with electric lights. One, the *Vermont*, located at the New York navy-yard, is about to be installed, sufficient funds having been appropriated for that purpose. If the navy-yards are supplied with a central station, the receiving-ships can be lighted from that station, rendering it both unnecessary and unadvisable to have separate plants for their use. The *Vermont* is an exception, since to light her from the central station at New York would require the use of a submarine cable, which would be costly and difficult to keep in repair, on account of the passage of ships, anchoring, and dredging.

#### ELECTRIC MOTORS ON SHIPBOARD.

A one-half-horse power Sprague motor has been installed on board of the *Yorktown* for the purpose of ventilating the dynamo-room. It is secured to the armored deck over the dynamo room, and belted to the shaft of the 24-inch Blackman exhaust-fan. The fan is shown in Figs. 1 and 2, the motor in Fig. 3, and the general scheme of using both in Fig. 4, Plate 4. When first used the motor heated excessively, and it was feared that the armature would burn out. After several trials and examinations it was found that the motor was overloaded, caused by the belt being too tight and the fan bearings not in line; there were also deficient arrangements for lubricating the fan. In time all these defects were remedied, and the motor is now doing efficient service, the dynamo-room being well ventilated. It was not the intention of the present Inspector to have a belted motor for this purpose, but the apparatus was installed by the Bureau of Construction and Repair, and was not, therefore, under the Inspector's control. It is deemed best for many reasons that the motor should be directly connected with the fan shaft.

On board of the cruiser *Charleston* a one-half-horse power C. & C. motor is directly connected to a small fan similar to the Sturtevant blowers. In this instance cool air is drawn into the dynamo-room by means of the fan, the hot air passing out through a separate pipe, with an entrance at the highest point of the curved armored deck over the dynamo-room, by natural draught. This fan works very well, but is deficient in power and does not keep the dynamo-room sufficiently cool.

On board of the *Baltimore* a fan of similar design has been located. It exhausts the hot air from the dynamo-room into the engine-room, fresh air being supplied through a pipe connecting from the deck by nat-

nal draught. This has been tried, but the motor heated too much, and is now being rewound. It is expected, after sufficient experiments have been conducted, that very serviceable motors and fans for ventilating purposes will be supplied. It is also hoped that small fans for agitating the air, which can be attached to any lampsocket, may be produced at sufficient cost so that they can be supplied to ships.

The plan for the motor to be used in ventilating the *San Francisco* is shown in Plate 5.

A Sprague motor has been placed on one of the 8-inch gun-carriages of the *Chicago* for training the gun. It has not yet been tried, but will be run by the incandescent dynamos of the ship. It is only a few inches elevated above the spar-deck, and it is feared that its exposure to the weather, rain, and salt water on the deck will interfere with its efficient service. A small ordinary winch with a motor attached has been introduced into the *Atlanta* for hoisting shell, but no reports are at hand concerning its value, except that it is very heavy and bulky.

The use of motors, and many other interesting problems in connection with the use of electricity on board ship, are fully discussed by officers on duty under the present Inspector in General Information Series No. 8, issued from the office of Naval Intelligence for the current year.

#### OFFICE ASSISTANTS AND CLERICAL FORCE.

All matters pertaining to the use of electrical appliances on board ship having been transferred from the Bureau of Navigation to the Bureau of Equipment and Recruiting on the first of July last, the present Inspector was at that date relieved of all duties in connection with the Bureau of Navigation, and has continued since to carry on the duties in connection with the office of Naval Inspector of Electric Lighting only. At present there are attached to this office two officers as assistants, and one civilian, an expert aid. The large amount of correspondence carried on with the local inspectors at navy-yards and at the works of ship-builders, and with electrical companies, also the preparation of detailed specifications for electrical appliances in the new ships, has rendered this increase in office force an absolute necessity. At present all four are located in one room of moderate size, which is very deficient in necessary accommodations.

As appliances and fittings for use on ships are very different from those in use on shore, designs must be made for most of them, and it would be economy to employ a draughtsman in the office, since, without one, the specifications for these special appliances are necessarily made to read "of an approved pattern;" not knowing exactly what is required, bidders usually figure on a very safe margin. In the opinion of the present Inspector the use of a draughtsman and the collection of suitable models and patterns would decrease the cost of the work much more than the salary of a draughtsman, besides facilitating the spreading of the information necessary on such a technical branch as electricity.

On account of the great number of electrical fittings and supplies, in addition to those used for electric lighting purposes, now being introduced in the new ships, I beg to suggest that the name of this office be changed from that of Naval Inspector of Electric Lighting to Naval Inspector of Electric Appliances.

It is a difficult matter to find officers who are qualified to superintend the installation of electrical appliances on shipboard, and it is a matter of much regret that those who do qualify for this technical work can

receive no compensation for the additional amount of study and lab required to attain that end. In foreign services officers receive ext compensation for qualifying for such work, and when on duty at navy yards, Naval Academy, or Torpedo Station in our service, are provided with quarters and other perquisites, which it is impossible for them to receive when on duty under this office. Could this defect be remedied by legislation, in the way of allowing commutation for quarters, as the Army, or in some other way, it would be an act of simple justice.

At the dock-yard, Portsmouth, England, no less than one hundred and fifty men are employed on electrical work alone on board of naval ships. The present Inspector favors contract work, but if a few men skilled in doing labor of this kind were employed at navy-yards by the Government for repairs and changes, also for doing new work under some circumstances, the result would be economical and add much to the efficiency of the plants at present installed. This particularly applies to changes and repairs when ships are at the navy-yards, since under those circumstances contract work is very expensive.

Attention is called to the subject of electric signals. Under the present orders of administration the wiring for such purposes is done under the supervision of this office. At present, however, no recognized system has been adopted and the Inspector is at a loss to know what to provide for such purposes. I have the honor to suggest that a board be ordered to consider the systems now in use and recommend some one for adoption.

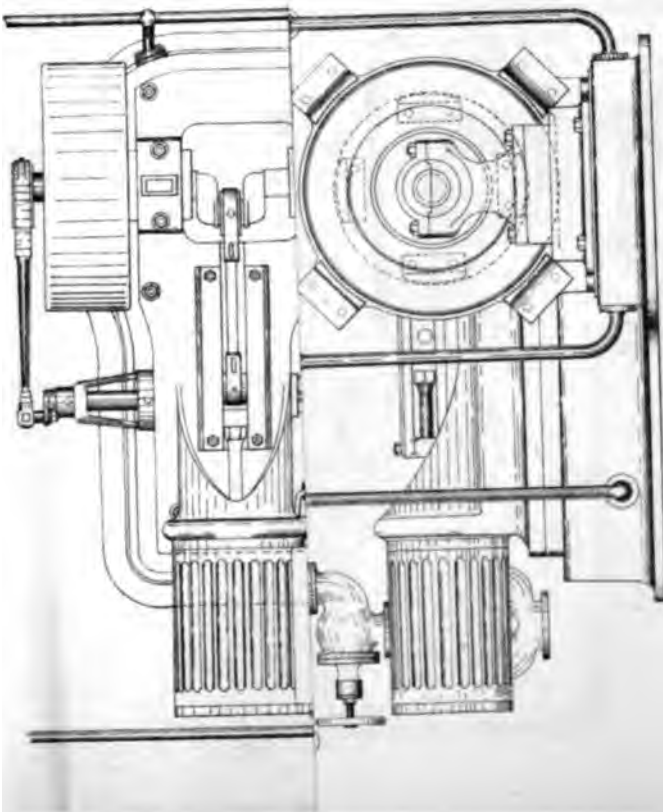
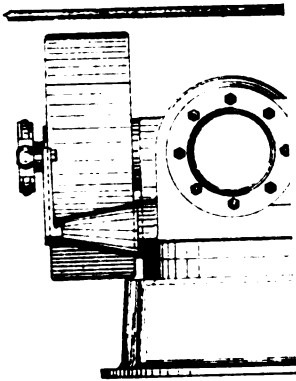
Attention is further called to the large number of officers employed in foreign services to supervise naval electrical work, a Commander with a large staff of assistants being attached to the English admiralty for this purpose alone. During the past year a great advance has been made in establishing in our own service a similar office. I have the honor to suggest that young officers who will volunteer for the special training necessary to qualify them to assist in this work be given every opportunity to attend courses of instruction at such institutions as the Johns Hopkins University at Baltimore, and others equally good, and that they be given duty pay while attending the course of instruction, also, if possible, to have their tuition paid and the necessary books supplied.

Respectfully submitted,

R. B. BRADFORD,

*Commander U. S. Navy, Naval Inspector of Electric Lighting.*  
CHIEF OF BUREAU OF NAVIGATION.

PLATE I





get a press. The character of our publications is such that they should be issued regularly without any possibility of delay or interruption. They differ materially from the job work of the rest of the Department and the one should not interfere with the other. To be economical and effective the technical character of Hydrographic Office publications makes it necessary to have the proof-readers (generally officers) near the printers at all times. For this reason and the fact that it always has more than can be accomplished promptly, our work can not be quickly done at the Government Printing Office. As a measure of economy, convenience, and efficiency, the Hydrographic Office should have its own type-printing plant and it is now in a fair way to get it.

As soon as space shall be available, also, power will be applied to the plate printing presses. Hand power is not economical, nor, with the present demand for charts, is it efficient. Plans have been prepared and no efforts will be spared to accomplish it.

Much progress has been made with machine engraving. Messrs. Ourdan & Kolb, engravers, have completed a machine which promises to revolutionize the engraving of figures and letters. They are now at work with it on a plate. Mr. Littlehales, the assistant in charge of the Division of Chart Construction, has also invented a machine for this purpose which is in course of construction. It has been the policy of the office to encourage, in a liberal manner, all its employés who show any disposition to improve the character of the work either by the invention of apparatus or the preparation of original matter in manuscript. The good results of this are forcibly demonstrated by Mr. Ourdan's machine, Mr. Littlehale's pamphlet on the Development of Great Circle Sailing, Mr. Hayden's monograph on the March Blizzard, Lieutenant McCartney's translation of Hautreux's paper on Collisions at Sea, and Mr. Herrle's series of Gnomonic Charts. This list does not comprise all the original work by any means. Much talent is expended in the preparation of the current publications by Mr. Leach on the Notices to Mariners and Light Lists, Messrs. Ray and Orr on Sailing Directions, Messrs. Hayden, Lerch, and Dutton, on the Pilot Chart and Supplements, and in the improvement of methods of chart supply by Lieutenant Coffman and Ensign Whittelsey.

The establishment, with your aid, by the Secretary of the Navy, of better rates of pay for the civil employés is a great reform, and in my opinion insures the future of the office. I wish to put on record the following extracts from my letter to the Bureau making this recommendation :

The sums allotted to the various employés are entirely incommensurate with the character of their work and lower than the salaries paid by other bureaus of the Government. The drawing, engraving, and marine meteorological work now produced by the Hydrographic Office is of a very high grade. There is a belief among the employés in the future of their office, and it is owing to this, and to the fact that most of the men are young, that no very great dissatisfaction has yet appeared. I take this opportunity, therefore, to express the conviction that the men selected to perform the scientific work to be expected from this office should have their salaries increased, as fast as the state of the appropriation will admit, until they are equal to those paid by the Coast Survey, Geological Survey, and the Signal Service. Under the system formerly followed the fund for extra drawing and engraving, and extra labor in general, was drawn upon for contracts with outsiders, and chiefly spent in this way. This was discovered to be a source of loss to the office, and experiments were instituted to determine whether the work could not be more economically and satisfactorily done by bringing the outsiders in as per diem employés. It was found that it could be done from 75 to 100 per cent. cheaper, and, being under direct supervision, it was much more satisfactory when completed. This, with the provision for expert marine meteorological work for the Pilot Chart, has been the reason for the establishment

and growth of the per diem system in the Hydrographic Office. The men thus brought in have become a valuable part of the permanent force, and, in the absence of money to raise the salaries of the most deserving, I recommend that their per diem be changed to an annual compensation. This will entitle them to the privilege of leave, and is equivalent to an increase of salary.

In this general connection I would like to express the conviction that the salaries of the employes of the Hydrographic Office should be subject to frequent revision. The sum for their payment should be regarded as a fund *for work*, and not a fund *for places*. It often happens that the ratio of employes of the different classes should be changed. Work requiring the co-operation of several kinds of scientific talent can not always be economically done if the numbers in each class are kept rigidly the same. But perhaps the most forcible argument is the fact that in the comfortable feeling of filling a *place* he who occupies it very speedily loses sight of the *work* to be accomplished. With no incentive but the rare promotions allowable by death or resignation interest and zeal are lost, and the individual speedily deteriorates into an indifferent workman, whose only effort is to do just enough to avoid dismissal.

Efforts have been continued to improve the chart service to the ships of war. The present system seems to give general satisfaction, but it is hoped to improve it. This work requires the active supervision of a very capable officer and the utmost vigilance on the part of all connected with it. In addition to a careful scrutiny in the office of all foreign publications which note the issue of British Admiralty charts, Captain Wharton, R. N., the hydrographer to the Admiralty, to whom the thanks of the Department are particularly due, takes great pains to inform us at the earliest moment of the issue of new charts or of new editions. Mr. B. F. Stevens is immediately directed to send copies to the proper ships. Attempts have been made to expedite this by having the charts sent at once from London without the intermediate action of the office. Lieutenant Buckingham, U. S. Navy, the naval attaché there, has expressed himself as desirous of helping in any way possible, but as it would require the close and entire attention of one officer I have not felt justified in asking him to attempt it.

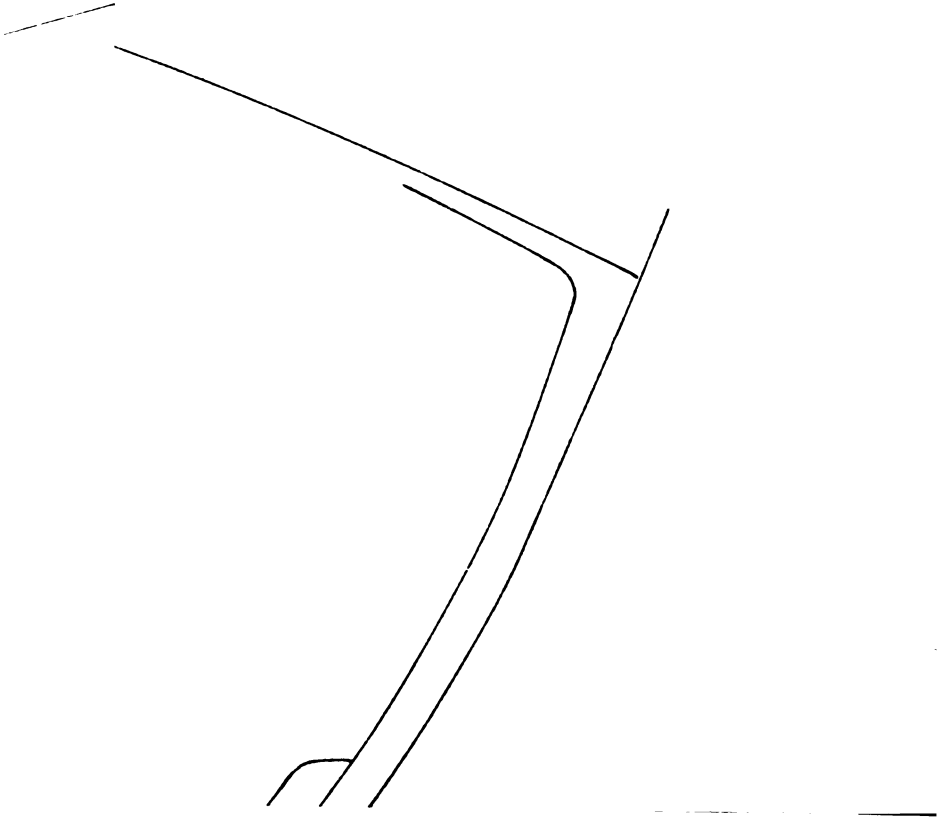
The same system in operation with the British Admiralty charts has recently been commenced with the charts of the Coast and Geodetic Survey. With the assistance of Lieutenant-Commander Brownson, U. S. Navy, hydrographic inspector Coast and Geodetic Survey, at the instigation of Lieut. M. L. Wood, U. S. Navy, this matter has recently been brought to a satisfactory conclusion. Through the successful efforts of these officers in improving the charts of the Coast and Geodetic Survey this change, which has long been discussed in the Hydrographic Office as desirable, has been brought about.

The stimulation of the sales of the Hydrographic Office charts and sailing directions has occupied a large share of attention. The opinion of the sales agents has been diligently sought as to what localities should be charted and what scales should be used. This has been productive of considerable good and has brought to light many defects in the agency system which have since been remedied. The universal comment that the prices of the charts were too low caused an examination of the method of fixing prices in the office, and a new price-list, based strictly on the demands of the statute, has been issued, the result having been to raise the prices somewhat. With the increase in the number of charts and the augmentation of our foreign commerce, it is hoped that the revenue from this source will finally make the office self-supporting.

Preparations are making for a report to be presented to the International Marine Conference of matters in which the Hydrographic Office is interested, and with the assistance of the officers in charge of the branch offices it is hoped that material of much value will be at hand

# PLATE IV

*iron straps  
for*





kept in the same building. They are now stowed in the Navy Department for security against fire, and while the best care possible is taken, yet the frequent handling and carrying long distances is a source of much damage. A fire-proof room with all the requisites for the proper handling, care, and preservation of these plates is a necessity.

Sixty-six new charts have been engraved and published during the year. The general localities covered are in Newfoundland, Nova Scotia, West Indies, Gulf of Mexico, South America, California and islands in the Pacific and East Indies. The publication of the great circle sailing charts of the North and South Pacific and Indian Oceans completes the set of these charts for the great oceans. These charts are much appreciated, and those of the North and South Pacific and Indian Ocean will be found particularly useful.

The charting of the *Ranger's* survey has been continued and the first of the series of special coast charts, San Diego to San Quentin Bay, has been published; the second of this series is ready for engraving. In addition 10 charts have received important corrections amounting to the redrawing of portions; 6 miscellaneous plates have been finished, including the stereographic projection arranged for graphic solution of spherical triangles by Commander C. D. Sigabee, U. S. Navy; 34 blank plates purchased and 22 made serviceable by scouring down and polishing condemned plates. The number of plates available for printing is 505; of miscellaneous plates, 103. During the year 21,885 copies of charts were printed and accepted, being the greatest number ever printed in a single year by the Hydrographic Office. Thirty-four charts are in process of construction and 10 charts are undergoing extensive alterations and corrections.

The work of tabulating deep-sea soundings has been continued; 35 sheets have been outlined for the Pacific, and a graphic memorandum prepared showing where such work is most needed. Important soundings have been received during the year.

The record of longitudes and the investigation of magnetic variation have been continued. A map of the lines of equal magnetic variation over the peninsula of Lower California and adjacent localities, based upon the excellent magnetic work of Lieutenant Pond, U. S. Navy, was published at the close of the year 1888. Tables showing the magnetic variation and rate for any year for positions in Lower California, Mexico, Central and South America, and in the West Indies have been prepared and are shown in the appended divisional report. The observations for magnetic variation, dip, and intensity, lately completed by Lieutenants Norris, Laird, Holcombe, and Ensign Wood, will furnish valuable results for additional localities in Mexico and Central America.

A manuscript entitled "The Development of Great Circle Sailing," prepared in the division, has been in the hands of the Government Printer since 1888. A new table of meridional parts for the more accurate projection of charts has been completed. A paper upon the use of oil, embodying the result of studies upon the calming effect of oil on broken water has been prepared and published in the Naval Institute proceedings. There is in preparation for publication, in serial form, the work on the record of longitudes.

The future work of this division will be the charting of such localities as are most frequented by American commerce, in the order of their importance. It will take many years, with the present force, to accomplish this.

The present force consists of an assistant in charge, one computer, one clerk, ten draughtsmen, thirteen engravers, four apprentice en-

gravers, three printers, one apprentice printer, four laborers and one watchman.

#### CHART SUPPLY.

As the purpose for which the two divisions of Supply and Issue were organized separately was accomplished last fall, it was considered advisable in October to consolidate them into one, entitled the Division of Chart Supply. A still further improvement would be the concentration of the force and material of both parts into one room, but that is impossible at present. The two parts remain located as before, that having charge of Hydrographic Office and Coast and Geodetic Survey charts and the supplying of sales' agents being known as the Hydrographic Office section, and the other, having charge of the British Admiralty charts and the outfit of ships of war, as the British Admiralty section of Chart Supply.

The Hydrographic Office section receives from chart construction all Hydrographic Office charts published; from the Coast and Geodetic Survey copies of new charts and of such others as may be required. It keeps the supply on the shelves correct for all late information received; issues, through the British Admiralty section, Hydrographic Office charts to United States vessels and supplies them to the branch hydrographic offices direct; it also fills all orders from sales' agents for Hydrographic Office charts. Formerly this section kept a supply of Coast and Geodetic Survey charts for issue, but at the last of the fiscal year arrangements were made by which that Bureau issues its own charts direct, except in case of original outfits, when they are sent through the British Admiralty section. This method has scarcely had a trial, but doubtless it will prove of great advantage to both offices. Improvements in the system of making corrections to Coast and Geodetic Survey charts during the past two years and their increased accuracy, in consequence, have rendered it possible to dispense with the supplemental corrections previously applied in this office.

The work of this section is constantly increasing. There are now eight hundred different Hydrographic Office charts and a large number of copies of each.

During the past year 29,329 copies of charts, with necessary corrections, have been issued, being an excess of 5,202 copies over the preceding year. Agents required 981 more copies than during the past year, and the summary in the appended report shows a corresponding increase in the issue elsewhere.

From all sources there have been received 26,903 copies of charts and 29,329 copies issued.

The British Admiralty section supplies all vessels with their outfit of charts. It keeps on hand, corrected to date, such British Admiralty charts as the Hydrographic Office issues, and receives from the admiralty all new charts, which are carefully compared with standards to determine the corrections, alterations, and additions.

During the year the following-named vessels have been supplied with outfits: North Atlantic Station, *Boston*, *Constellation*, *Kearsarge*; South Atlantic Station, *Richmond*; Pacific Station, *Adams*, *Atlanta*, *Iroquois*, *Mohican*, *Monongahela*; Asiatic Station, *Dolphin*, *Scatara*; Special Cruise, *Atlanta*, *Constellation*, *Despatch*, *Enterprise*, *Fortune*; U. S. C. S. S., *Gedney*, *Jamestown*, *Juniata*, *Kearsarge*, *Richmond*, *Yorktown*, and school-ship *St. Mary's*.

The branch office in San Francisco was furnished with a complete set of Pacific and Australian British Admiralty charts.

The total number of copies of charts received during the year was 17,275; these included British Admiralty charts from London; United States Hydrographic Office and Coast Survey charts from the Hydrographic Office section; and outfits returned from ships.

The total number of copies of charts issued during the year was 15,468; these were furnished to United States vessels, the branch offices, and the various divisions of this office. One thousand three hundred and three copies were condemned; 6,889 copies received hand corrections. Thirty new British Admiralty charts have been put on issue.

The end of the year finds the work of this division well in hand.

The force consists of one lieutenant, in charge; one ensign, four draughtsmen, one clerk, one copyist, one colorist, and two laborers.

#### SAILING DIRECTIONS.

The functions of this division comprise the preparation and correction of sailing directions, notices to mariners, light lists, and other publications bearing on subjects relating to hydrography and kindred branches. It also supplies the ships of war and the sales' agents with the publications, except charts, of the Hydrographic Office, and has the care of the archives and library of reference.

The books of reference and sailing directions were moved early in the year to the room adjoining the archives. This has facilitated the work very much by bringing the detached parts of the division together, in pursuance of the plan formed some time previously.

During the year eighteen ships have received complete or partial outfits of sailing directions. Two new branch offices have been supplied, and complete sets of Hydrographic Office publications were sent to the Paris Exposition and to the Boston Public Library.

Hydrographic Office No. 86, Caribbean Sea and Gulf of Mexico, Vol. I, and Light Lists, Vols. I, II, and III, compiled in the division, were published.

A reference to the very complete report of the chief of this division will show in detail the work accomplished.

Besides the labor of keeping at least five copies of each book of sailing directions corrected and ready for issue (the corrections for one notice, No. 52 of 1888, required three hundred and twenty-five corrections in two hundred and forty different books), the division is constantly occupied in answering various questions relating to the hydrography and geography of all parts of the world. At the same time it has been the endeavor of the office to supplant foreign sailing directions with our own publications. Three volumes of these have been gotten ready for the printer, one of which will soon be issued. The manuscript of two others is in an advanced state of preparation. The manuscripts sent in by the officers in charge of the branch offices have not yet been revised, but will be taken up, as well as much other matter already compiled, whenever the opportunity presents itself.

At the rate of the present appropriations the time when the Hydrographic Office will complete its set of sailing directions is indefinite. The useful life of one of these publications is from five to ten years. If the office within a reasonable time could publish a whole set of directions it would then be comparatively easy to keep corrected those already issued. Larger appropriations would permit of this in the course of a few years. We are now dependent upon foreign offices for the necessary instructions for a large part of the waters of the navigable globe. The disadvantages of this situation are so obvious that Congress will

surely grant sufficient money to enable us to be independent of foreign sources of supply.

The Notices to Mariners have been prepared and issued promptly each week. The plan of grouping extracts from these notices, covering the same general locality, has worked well, and the edition of such extracts has largely increased, being now at the rate of over 1,000,000 yearly. Seven hundred and seventy thousand and twenty-nine copies have been issued during the year, 518,000 of these during the past six months. A glance at the summary of notices in the appended report shows an increase of over 300 per cent. in the past three years and nearly 100 per cent. in the past year. Better facilities for printing will be afforded in a short time and we may expect a larger output of this valuable material.

There have been received, classified, and indexed in the archives 1,200 documents and 700 charts. These are carefully preserved and kept ready for immediate reference.

Valuable information has been received from most of the ships in the service and from many merchant vessels.

A pamphlet on collisions at sea, by Lieutenant Hautreux, French navy, has been translated for use before the International Marine Conference.

There are now attached to the division one lieutenant in charge, one lieutenant, one assistant, two nautical experts, one custodian of archives, one draughtsman, and two laborers.

#### MARINE METEOROLOGY.

The work of this division, now thoroughly systematized, has been conducted with great efficiency during the year. The Navy can now be kept conversant with the latest information in regard to this important subject, the serious study of which had been neglected by the Department for many years. One of the earliest projects of reform in the Hydrographic Office was the establishment, on a permanent footing, of a division of marine meteorology, where the collection and dissemination of data could be carried on without interruption, and where instructions for the service could be prepared and revised in accordance with the progress of the science of meteorology. Since the time of Maury several well-devised and temporarily successful attempts had been made to accomplish this, but they failed on account of the instability of the force employed. Funds which might have been made available for this purpose were used for other objects, and the work projected was done entirely by officers. These, after getting just fairly acquainted with the subject, were ordered away, so that no continuity of effort was possible. It was evident that this course should be no longer pursued. A good organization being a matter of slow growth, it is only during the past year that this division can be said to have been fairly established on the lines laid down as necessary for its success. As now constituted there is a permanent force of marine meteorologists and clerks, re-enforced by officers who are interested in the study of meteorology and who can be spared from other naval work. It is expected that this combination will be able gradually to develop pilot charts of all the oceans similar to that now issued for the North Atlantic. Such graphic current publications devoted to ocean meteorology will enable the Navy and merchant marine to keep thoroughly informed of the state of the science. This in turn will stimulate the observers to greater care and increase their desire to study at sea the problems

that still puzzle meteorologists. In this connection the subject of cloud formation seems to offer a very promising field for the attention of seamen who possess photographic outfits. The studies of Abercromby, Ley, and others show unmistakably that this factor can be used much more extensively in the prognostication of weather at sea. A publication of instructions in regard to this will be issued shortly. There are several matters to be ultimately worked out in this division which the limited force will not permit at present. The Government should issue its own meteorological instruments to seamen observers. The necessity for this has long been recognized by the meteorological offices abroad, where barometers and thermometers are supplied to reputable seamen, and one is thus able to rely upon the accuracy of the observations. The few instruments in general use in the merchant marine are not of the quality to give good results for record, and the lack of any instruments is a serious drawback to the increase in the number of marine observers. The subject of self-registering instruments is also one which should have immediate attention. There are some now in the market that should be tried on our ships of war, and, as instruments are continually undergoing improvement, it will require the active supervision of the division to keep pace with the subject. The larger matters of storm warnings in the Bay of North America, more particularly with reference to West Indian hurricanes, and storm signals on the coasts can only be developed through the aid of the Signal Service of the Army. The Navy has a vital interest in this, and must get its information mainly through the Hydrographic Office. The Chief Signal Officer has always been most willing to give assistance, and has expressed himself as desiring to meet, as far as possible, the wishes of the Hydrographic Office, as indicating the necessities of the Navy and merchant marine in this respect. The best results in this direction are expected from the establishment of a marine observatory at Havana, under the direction of Captain Carbonell, of the Spanish navy, working in co-operation with Rev. Father Vines, of Belen College Observatory. There is now an organized system, extending through the West Indies, for the transmission of reports, during the hurricane season, through the Havana office to the Signal Office. This has been brought about by the Signal Office, assisted in a great measure by the efforts of the Hydrographic Office in correspondence with various observers in the West Indies, and by the visit of Mr. Everett Hayden, marine meteorologist, to Cuba during the hurricane months of last year. This promising field should be occupied by the Navy. The Department should establish stations throughout the West Indies, and, in co-operation with the Signal Service, bring the subject of West Indian hurricane warnings to a greater degree of perfection. The co-operation of the Hydrographic Office with the Signal Office in the collection of all marine meteorological data (formerly collected, in large part, by the Army) has been attended with good results. The material, as fast as used for the Pilot Chart, is transmitted to the Signal Office for the compilation of synoptic maps of the Northern Hemisphere, and such other use as may seem best. The seamen of the merchant marine have expressed themselves quite generally in favor of the change, holding that the Navy should do all that part of the work which relates to the sea.

The Pilot Chart of the North Atlantic has been enlarged and improved, and continues to gain in popular esteem, and the same may be said of the Weekly Supplement.

The issue of a current publication devoted to the subject of the meteorology of all the oceans has been considered at various times during

the year, but owing to lack of expert force and printing facilities no definite conclusion has been reached. It is hoped now, as the latter have improved, that the immense amount of data at hand can be utilized in this way.

The appended report of the chief of this valuable division will give interesting details in regard to what has been accomplished. The establishment of fair rates of pay, now accomplished, will attract good men, should the office be so unfortunate as to lose any of the present force, and the service is to be especially congratulated that Mr. Hayden has fully concluded to devote himself permanently to the work he has been so instrumental in organizing, and for which his talents, knowledge, and experience fit him in such an eminent degree.

The force in this division consists of one lieutenant, in charge; one ensign, one marine meteorologist, three nautical experts, one stenographer, one type-writer, and one laborer.

The suggestions of the chief of division that a number of naval officers be detailed to take a course of practical study in the Signal Office is an admirable one and should be carried out at once. Every effort should be made to acquaint the officers of the service with the subject of meteorology. The importance of this subject to seamen is obvious.

#### BRANCH HYDROGRAPHIC OFFICES.

The system of branch hydrographic offices has proved its value to the maritime community and to the Navy in many ways, and should be extended to include every shipping point of importance on the Atlantic, Gulf, and Pacific coasts. Indeed, in view of the enormous commercial interests on the Great Lakes and tributaries, it may well be considered whether branch hydrographic offices established at several of the most important ports there would not be of advantage to commerce and to the Navy. Many inquiries reach this office from shipping firms and others engaged in commerce on the lakes, and the detail of an officer for such duty might be the means of building up as useful an office at Chicago, Cleveland, Detroit, or other port as at any point along our Atlantic, Pacific, or Gulf coasts. It will be hardly possible, with the present number on the register, to keep an officer at each point, but among the ex-naval cadets now available there is fine material for filling the less important stations to be supervised by the officers stationed at the larger ports. Duty of this character, more than any other, brings officers into close relations with the merchant marine and the large interests devoted to shipping. It is of great benefit to both, and acts most favorably on public opinion in regard to the Navy. This effort of the Department to take an interest in maritime affairs is highly appreciated. The Navy Department is regarded as the natural leader in all nautical matters, and by the extension of this system can take the place along our coasts in all subjects of a hydrographic nature which the best interests of the Government and the technical education of its officers entitles it to have.

*Boston.*—This branch labors under the disadvantage of not having the assistance of a maritime exchange. There is no organization in Boston devoted solely to the interests of the maritime community. It is more difficult, therefore, than in other sea-board cities to secure united effort in behalf of any measure. Notwithstanding, the office has been very successful in collecting and forwarding a large amount of valuable information.

The different water-fronts of Boston are widely separated and, with the means at disposal, difficult of access. The consequence is that many vessels come and go without being boarded, and many chances of obtaining information are lost. As suggested in previous reports, there should be a small steam-launch sent from the navy-yard each day to carry the boarding officer on his round. This would enable him to visit the most distant parts of the harbor and return in time to make and forward his records for the day. The importance of boarding every arrival can not be overestimated. It stimulates the seamen observers to better work, gives them an idea that the Government appreciates their voluntary labors, and turns them into active agents to induce others to help. The necessity for the uninterrupted continuation of this is shown by the fact that while the ship-visitor was ill for a short time the number of callers at the office sensibly diminished.

The Pilot Charts, here as at all of the branch offices, are in great demand and have become a part of every vessel's outfit before sailing. The routes indicated are becoming the recognized pathways of the ocean and now the Banks are seldom crossed during the ice season by steamers from Europe bound for Boston.

Five hundred pamphlets of blank forms for observations at Greenwich noon were issued during the year. The observation of the officer in charge seems to show that they are easily comprehended, and when returned by the observers are almost always properly filled out. Many calls have been made for charts of the harbors of Nova Scotia. The Hydrographic Office charts are generally preferred when the masters of vessels are allowed to use them.

Ensign H. S. Knapp, U. S. Navy, who was attached to this branch for several months, left a record of efficiency which guarantees his value to the Hydrographic Office whenever it can secure his services. His thorough comprehension of the business character of branch office work, his tact in dealing with masters of vessels and shipping people generally, his activity and intelligence in promoting the interests of the Navy in every direction, make him a most desirable assistant.

This branch has distributed 157,595 copies of notices, 7,230 Pilot Charts, and 19,376 Supplements. It has boarded during the year 2,434 vessels.

The force has consisted of one lieutenant, in charge, one ensign, during a portion of the year, one ship-visitor, and one messenger.

*New York.*—The vast amount of information collected and disseminated and miscellaneous work done will be seen from the appended interesting report of the officer in charge of this branch. This office is regarded as a regular authoritative intelligence bureau, both at home and abroad, for all matters pertaining to maritime affairs. Its business is constantly increasing, so much so that the force permitted by the appropriation is totally inadequate, and it has long since outgrown the space so generously assigned to it by the Maritime Exchange. A change to more commodious quarters having become a necessity, negotiations for this purpose have been in progress for some time and with every indication of ultimate success.

As a large share of the marine data for the Mascart cablegram comes to New York, the officer in charge is obliged to devote most of each forenoon to its compilation. Sundays and holidays are not excepted. In response to circulars from the main office an exhaustive investigation was made as to the value of a light on Matanella Shoal, Bahamas, also valuable data in reference to the steaming and maneuvering powers of ocean steamers for the Office of Naval Intelligence. Data for the use

of the commissioners of the coming International Marine Conference have been collected and forwarded.

A great deal of time has been spent in the endeavor to increase the number of trustworthy seamen observers, and much success in this direction was obtained among the yachtsmen. Owing to lack of instruments, and for other reasons, not much has been effected with the pilots and coasters.

The officer in charge speaks at length of the value of the Pilot Chart and the various supplements relating to the Joggins Raft, the remarkable cruise of the derelict *W. L. White*, the instructions in regard to hurricanes, the use of oil in laying the sea, the monograph on the March blizzard, and many other matters of interest showing what an important part this branch plays in the general scheme of work laid out for the Hydrographic Office.

As at Boston, a small launch would greatly facilitate the boarding of vessels, besides increasing the number tenfold. Vessels could be reached at the outer anchorage and information obtained at once. When ships are hauled into dock they are generally put in charge of a watchman, and the cabin containing the log and barometer is locked. The current outlay for such a launch would be small, and a sum equal to the fares now paid on the railroads by the boarding officers would probably cover the running expenses. Late news is becoming more and more important; much of our information is now received too long after date to be of much use, except as history.

Sergeant Cox, U. S. Army, at New Haven, and Sergeant Daniels, U. S. Army, at New London, were directed by the Chief Signal Officer to co-operate with this branch in the collection and dissemination of data. They and Captain McNiell, harbor master at Bridgeport, Captain Townsend, harbor master at Newport, and Mr. John McWilliams, the collector of customs at Providence, have been of great assistance at their respective ports.

The officer now in charge of this branch, in his appended report, pays a well-merited tribute to the intelligence, tact, and industry of his predecessor, Lieut. V. L. Cottman, U. S. Navy, who was detached from the New York branch before the end of the fiscal year. The success of this important branch dates from the moment Lieutenant Cottman assumed charge, and his whole administration was marked by a thorough appreciation of the responsibilities of the position, an unremitting energy in the prosecution and extension of its usefulness, and an unusual capacity for gaining the good-will of the entire community. The school-ship authorities of New York are to be congratulated on obtaining the services of this capable and thorough-going officer.

This branch has distributed 261,690 copies of notices, 15,085 Pilot Charts, and 9,983 Supplements; it has boarded 6,408 vessels.

The force has consisted of one ensign (since March), in charge, one assistant, one ship-visitor, one clerk, and one stenographer and typewriter.

*Philadelphia.*—A comparison of the tables in the appended report of this branch with the tables of preceding years shows a very large increase in its business. The number of vessels visited, items of information furnished, Notices, Pilot Charts, and Supplements distributed has largely increased.

The signal offices at Wilmington, Charleston, Savannah, and the agent of the Maritime Exchange at the Delaware breakwater have rendered valuable assistance by the prompt transmission of much important information.



With the Maritime Exchange the office was moved on April 1 into new quarters, and has now better facilities in every respect. Since the transfer the time-ball has not been dropped, as there are no funds to pay for connecting the dropping apparatus.

On the 24th of June a circular was issued from the Washington office directing the branches to call the attention of shipping people to the value of the derelict *Ottawa*. From the information given through the Philadelphia branch she was picked up by the Red Star Line tug *Argus* and towed into port, saving a valuable cargo and clearing the transatlantic route of a dangerous obstruction.

Five thousand two hundred and sixty-three copies of the Pilot Chart, 10,676 Supplements, and 224,561 Notices to Mariners were distributed.

The force has consisted of one lieutenant, in charge, one ensign, one ship-visitor, and one messenger.

*Baltimore*.—More than double the usual number of copies of Notices to Mariners have been distributed from this office during the past year; the number of ships visited has been 700 more than the last year, and in all directions the office shows a large increase in its business. Such arrangements have been made in regard to the distribution of hydrographic information that all ship-masters can readily obtain the latest before sailing.

The special information given from the office during the year can not well be tabulated. Masters of ships and others have shown a grateful appreciation of the assistance rendered and much interest has been awakened. Here again the Pilot Chart is of great use, more especially to the traders in the West Indies, to whom the hints and directions in regard to hurricanes have been valuable.

Much time has been given to the discussion of matters to come up before the International Marine Conference, and the views of many captains have been obtained. The changes desired in the present rules of the road are many, but all agree that the most important is a uniform system of fog signals to indicate approximate courses in fog.

There are still many charts brought in for correction which are old, worn, out of date, and practically useless. The officer in charge is of the opinion, like his predecessor, that marine underwriters should require ships to be fitted out with the latest editions of charts. This must eventually be the case, if indeed the influence of the branch offices does not render it unnecessary by educating ship-masters to provide themselves from motives of self-preservation.

Sixty-nine thousand one hundred and eighty-nine copies of Notices have been distributed, also 2,603 Pilot Charts and 7,802 Supplements.

The force has consisted of one lieutenant, in charge, and one ship-visitor.

*Norfolk*.—The office was established in this city on March 1, 1889, and by the 13th of the same month was in thorough order. Through the courtesy of the collector of customs space was assigned in the custom-house, and every facility given to inaugurate the work. Commercial organizations and all interested in shipping have given a hearty support to the office.

The central position of Norfolk and its proximity to the coast and to various shipping ports make it an important point for the establishment of a branch office. The port of Newport News and the pier at Lambert's Point have become important coaling stations of our Atlantic coast. If the schooners and small coasting vessels ascending the James River or going through the canals be taken into account, there is more

tonnage passing through Hampton Roads than goes up the bay to Baltimore.

A large amount of information has already been given out, and the business of the office is increasing daily.

Five hundred and seventy-six copies of the Pilot Chart, 832 Supplements, and 1,854 Notices have already been distributed.

Advantage is taken of this opportunity to refer to the efforts of the officer in charge of the branch to further the interests of his office by preparing a series of articles on hydrography for a leading newspaper published at Norfolk. Such publications, guarantied as they are by the position of the writer, serve to interest shipping people and others in the important work of the Hydrographic Office and are in the highest degree commendable.

The force consists of one lieutenant, in charge, and one ship-visitor.

*Savannah.*—This branch has but recently been established and is not yet in active operation. Much is expected of it later in the season, when the cotton crop begins to move. Its proximity to Brunswick, Ga., a valuable point for a suboffice, will give it an importance second to none of those at the smaller ports.

The force consists of one lieutenant, in charge, and one ship-visitor.

*New Orleans.*—The season when shipping is very active at this port is short, yet much has been accomplished by the officer in charge.

The Signal Service observers on the Gulf coast have co-operated with the office and distributed many hydrographic forms, etc.; the result of such distribution will be more evident during the coming year.

The Pilot Chart is much sought after and appreciated. A larger issue of this publication would be beneficial, as many who wish the charts can not now be supplied.

The time-ball has not proved altogether satisfactory, as the wires have been much interfered with just at the time the signal from Washington was due.

During the year 1,428 Pilot Charts, 2,983 supplements, and 46,905 notices have been distributed.

The force has consisted of one ensign, in charge, and one ship-visitor.

*San Francisco.*—A large amount of efficient work has been done by this office, particularly in the direction of extending its usefulness in new quarters. An effort has been made to enlist the services of missionaries and others living in the Pacific islands to keep meteorological records. Many data have been collected for the issue of a Pilot Chart of the Pacific. Such a publication would be of great service to navigators in that ocean, and before many months Congress will, no doubt, take suitable action to satisfy the desire of the representatives of our large and increasing commerce in that ocean. Even if Western interests only were at stake, the desire would be a reasonable one, but Eastern shipping interests are also involved in this question, and they too will be benefited. To satisfy this necessity as far as possible with the means at disposal, this branch has issued special monthly bulletins of hydrographic information useful to mariners in the Pacific. These have met with favor and reflect great credit on the officer in charge.

The increase in trade at Port Townsend, Wash., and at San Pedro, Cal., make them important commercial centers, and branch offices should be established at these cities.

This office, like the others, has grown so in usefulness that the space allotted to it by the Merchants' Exchange is no longer sufficient. Some new arrangement must be made speedily, and there must be an addi-

tion to the force. It is remarkable that so much is accomplished with such surroundings and by so small a force, and it can only be accounted for here as elsewhere, by the fact that the popularity of the work, its immediate and evident value, stimulate to the utmost all who are engaged in it.

The office has distributed 21,788 copies of Notices, 5,300 special bulletins, and given 14,045 items of information.

The force consists of one lieutenant, in charge, one assistant, and one ship-visitor.

*Portland, Oregon.*—Through the courtesy of the Portland Board of Trade this office was established in the Merchants' Exchange on March 25, 1889. Although in the dull season of the year, a large amount of work has been done already, and the office promises to be of much value to the northwest coast. The officer in charge reports that frequent calls have been made for a Pacific Pilot Chart, already referred to under the San Francisco branch; also, that a time-ball at Portland would be useful. The establishment of this branch office gives a good opportunity to the Department to assist the maritime community in this respect.

A branch office at Port Townsend, Wash., is needed.

Since the office has been established 57 copies of the Pilot Chart of the North Atlantic and 3,649 Notices have been distributed and 63 vessels visited.

The force consists of one ensign, in charge, and one ship-visitor.

#### SUMMARY.

The following table shows the most important work done by the branch offices.

	Boston.	New York.	Philadelphia.	Baltimore.	Norfolk.	New Orleans.	San Francisco.	Portland, Oregon.	Total.
Vessels visited.....	2,434	6,408	1,956	1,886	132	340	1,055	63	14,774
Barometers and thermometers adjusted and compared.....	2,254	3,351	1,695	282	8	413	309	5	8,212
Chronometers compared and rated.....				423		44	54		521
Charts corrected for merchant captains.....	10	92	28	81	120		365	3	649
Light lists and buoy books corrected for merchant captains.....			3,028	1,288	83			475	4,794
Items of information furnished.....	21,261	71,135	25,140		3,834	788	14,045	1,231	137,749
Pilot Charts distributed (copies).....	7,280	15,085	5,203	2,603	576	1,428	195	57	27,467
Supplements distributed (copies).....	19,376	9,983	10,076	7,802	832	2,963		2	51,064
Light lists, beacon and buoy lists distributed (copies).....	7,848	3,034	3,432	1,378	118	1,243	614	251	17,923
Notices to Mariners distributed (copies of extracts).....	15,595	261,690	224,561	69,189	1,879	46,905	21,788	3,649	787,236
Reports forwarded on storms at sea, trade-wind limits, etc.....	2,287	8,450	3,213	544	60	444	682	35	13,715
Hydrographic Office and miscellaneous publications and forms distributed.....	2,645	7,339	2,198	469	106	638	897	264	14,536
Special bulletins and weather reports distributed.....							5,360	216	5,576

## THE INTERNATIONAL METEOROLOGICAL CONGRESS AT PARIS.

An invitation has been received to send a delegate to this congress, September 19 to 25, and I may well refer here to the importance of doing so. If impracticable to send an assistant from this office, then one of our naval officers abroad might be detailed for the purpose, although there are some manifest advantages in being represented by some one who is familiar with work in this office and who has made a specialty of marine meteorology. I regard it as essential that this office should send a delegate to every such conference, in order that we may profit by every advance that is made and at the same time acquire some personal knowledge of and acquaintance with methods and men abroad, without which it is difficult to obtain the best results in any specialty. Marine meteorology in particular is a practical science in which all nations are interested, and in which international co-operation is very necessary. The establishment and acknowledged success of our branch hydrographic offices, and the facilities for collecting reliable marine data from every ocean, put us in a position to take a leading part in marine meteorological work, which, however, must always be essentially international in character in order to obtain the best results.

## DERELICTS.

Nothing could demonstrate the value of the Pilot Chart and Weekly Supplement more forcibly than the fact that since these publications have been established our naval vessels have been able, in many instances, to find and destroy derelict vessels and other obstructions along the coast, and upon information furnished by the Hydrographic Office private companies have undertaken to tow wrecks into port, and, in one instance, at least, successfully. The following extracts from the Pilot Chart and Weekly Supplement will be interesting in this connection:

## Pilot Chart, June, 1889:

The U. S. S. *Yantic*, Commander C. H. Rockwell, U. S. Navy, commanding, sailed from New York May 11 on a cruise off the coast to destroy derelict vessels, information regarding which was supplied by this office. May 18, in latitude 37° 35' N., longitude 69° 55' W., she sighted the water-logged schooner *Alice Borda*, of Camden, N. J., with deck-houses, hatches, and mizzen-mast gone, main-mast out of step and leaning forward. Torpedoes were exploded astern, under the bilge on each side, under the heel of the bowsprit, and inside the port quarter, breaking her up very well; she was then set on fire, and, it is supposed, went down on the night of the 19th, although it was very difficult to destroy her, being lumber laden. Unfortunately the *Yantic* encountered a hurricane of great violence the afternoon of the 21st, by which she was dismasted and compelled to give up her cruise and return to New York.

## Weekly Supplement, November 16:

In an official report to the Navy Department, Lieut. W. S. Cowles, U. S. Navy, commanding U. S. S. *Despatch*, states that he found and destroyed the wreck of a vessel sunk 15 miles east of Cape Henry.

## Weekly Supplement, November 28:

In an official report to the Navy Department, Lieut. W. S. Cowles, U. S. Navy, commanding U. S. S. *Despatch*, states that he found and destroyed the wreck of the brig *Hyperion*, sunk 14 miles SSE.  $\frac{1}{4}$  E. from Absecon light.

## Pilot Chart, July, 1889:

The abandoned Norwegian bark *Ottawa*, wrecked during the storm south of Nantucket on May 21, has been towed into Boston by the Red Star tug *Argus*, which started in search of her upon the recommendation of and furnished with information from this office. The *Ottawa* was found June 19 in latitude 42° 38' N., longitude 63° 34' W., in which position she was a great danger to navigation.

## Weekly Supplement, June 28, 1889:

The Red Star tug *Argus* found the abandoned bark *Ottawa* on June 19, in latitude  $42^{\circ} 38' N.$ , longitude  $63^{\circ} 34' W.$ , and towed her into Boston. This case well illustrates the value of accurate reports of derelicts. Second Officer A. Moar, of the British steamer *Mentmore*, sent to this office an excellent description of the *Ottawa*, accompanied by a neat sketch. From this and other information a circular was prepared and issued to the branch hydrographic offices June 4, suggesting that some one go out and tow her in. The *Argus* did so. She had to make two trials, but is well repaid now for the trouble and risk.

## Pilot Chart, August, 1889:

*The derelict American schooner Bushrod W. Hill.*—It will be remembered that a short time ago the Red Star tug *Argus* put to sea in search of the derelict Norwegian bark *Ottawa* and upon finding her (June 19, latitude  $42^{\circ} 38' N.$ , longitude  $63^{\circ} 34' W.$ ) towed her to Boston, thus ridding the sea of a very dangerous obstruction and at the same time securing salvage on vessel and cargo. It is to be hoped that the success of the *Argus* will call attention to the fact that similar opportunities often occur, and that prompt and reliable information can always be obtained at any branch hydrographic office, as was done, indeed, in this case. Every such attempt will be encouraged by all navigators of the North Atlantic, to whom derelict vessels are a source of very great danger. The same thing was tried the month just passed, but in this case, unfortunately, it was not successful. The American schooner *Bushrod W. Hill*, in ballast, was cut down by the Spanish steamship *Federico*, July 14, about 40 miles S. by E.  $\frac{1}{2}$  E. from Highland light, Cape Cod. The schooner was abandoned and soon afterwards capsized. She was reported July 18, 30 miles NNE. from Nantucket light-ship, and the tug *E. A. Burke* put to sea from Boston in search of her, followed the next day by the tug *Argus*. The latter found her July 20, in latitude  $41^{\circ} 15' N.$ , longitude  $69^{\circ} 32' W.$ , and the *E. A. Burke*, which reached her shortly afterwards, joined in the effort to tow her in. Great difficulties were encountered, as the vessel was bottom up and she finally sunk in 38 fathoms, Highland light bearing WNW.  $\frac{1}{2}$  W. (mag.) distant 9 miles. According to another report her position is 15 miles NE. from Chatham light.

## SURVEYS.

The *Ranger*, Commander F. A. Cook, U. S. Navy, commanding, has continued her work on the coast of Lower California, having extended the survey to include San Bartoleme Bay. Her officers have shown great enthusiasm under the most trying circumstances and the character of their work will challenge comparison with the best standards. The organization of this party in all branches, hydrographic, topographic, astronomic, and magnetic, is very complete and it is hoped that no considerations will permit of its being diverted elsewhere.

The work of the party has been distributed as follows: Lieutenant Harris, executive officer; Lieutenant Peck, navigator, astronomical work, and general supervision of hydrography; Lieutenant Lowry, main triangulation; Ensign Gill, coast triangulation; Lieutenant Halsey, Ensigns G. H. Stafford, Wright, and Knepper, boat work; Lieutenant Pond, magnetic, photographic, and sounding from the ship; Lieutenant Bartlett, Ensigns Jungen and L. J. Clark, watch officers.

Information of value to the work of this office has also been received from the following named ships:

*Adams*, Commander R. P. Leary; Lieut. J. F. Parker, navigator: Leading lights and beacons in Apia Harbor, Samoa. *Alliance*, Commander G. W. Pigman; Lieut. W. P. Day, navigator: Soundings, east coast of Patagonia. Fish Commission steamer *Albatross*, Lieut. Commander Z. L. Tanner; Lieut. H. S. Waring, navigator: Lines of soundings, Gulf of Alaska, Washington and Oregon coasts; location of the Cove and Braithwaite Bay; light, Man-of-War Cove, Magdalena Bay, discontinued; observations on Middleton Island; plan of Willard Bay. *Atlanta*, Capt. J. A. Howell; Lieut. N. E. Niles, navigator: Buoyage in Port Royal Harbor, Jamaica; buoyage and wreckage at

Cape Hayti. Coast and Geodetic steamer *Blake*, Lieut. J. E. Pillsbury: Chart showing improvements at Castries, St. Lucia. *Boston*, Capt. F. M. Ramsay; Lieut. O. G. Bowman, navigator; Lieut. W. F. Fullam, intelligence officer: Account of storm; hydrographic information concerning Livingston, Guatemala. *Constellation*, Commander C. J. Train: Report of gale September 25, 1889. *Despatch*, Lieut. W. S. Cowles: Measurements and sketch of measured 10-mile run, Delaware Bay. *Dolphin*, Commander G. F. F. Wilde; Lieuts. T. O. McLean and W. A. Marshall, navigators: Information concerning lights at Nicoya Gulf, Costa Rica, and Corinto, Nicaragua; directions for entering La Paz Bay by San Lorenzo channel; report of gale. *Enterprise*, Commander B. H. McCalla; Lieut. H. F. Fickbohm, navigator: Buoyage off Southampton, England; lights at Faro Island, St. Vincent, Malaga; information about rivers Seine and Scheldt. *Essex*, Commander T. F. Jewell; Lieut. C. D. Galloway, navigator: Changes in beacons and buoys at Port Said, Suez, and Aden; visibility of light at Gavdo, Candia; time signal at Malta; breakwater in construction at Funchal. *Galena*, Commander G. W. Summer; Lieut. W. J. Barnette, navigator: Buoyage in Cape Hayti Harbor; location of coast line, Hayti. *Juniata*, Commander W. C. Wise; Lieut. N. H. Barnes, navigator: Discovery of and soundings on Juniata Bank. *Kearsarge*, Commander A. D. Brown, position of Trinidad Island; currents in the Atlantic Ocean. *Lancaster*, Capt. T. F. Kane; Lieut. J. P. Morrill, fleet intelligence officer: Information concerning Guadalquivir River and Seville Harbor; time signal at Gibraltar. *Marion*, Commander N. M. Dyer; Lieut. C. F. Emmerich, navigator: Hydrographic information Wusung River, China; light at Tasman Bay; search for rock, Japan. *Mohican*, Commander B. F. Day; Lieut. F. M. Symonds, navigator: General information and survey of Fangaloo Bay. *New Hampshire*, Commander F. J. Higginson: Report of gale. *Nipsic*, Commander D. W. Mullen; Lieut. R. G. Davenport, navigator: Beacons and buoys in Straits of Magellan and in Tahiti; general information Apia Harbor, Samoa; boat landings and storm at Apia; abstract of log of H. B. M. S. *Calliope*. *Omaha*, Capt. F. V. McNair; Lieuts. J. M. Miller and J. B. Murdock, navigators: Tracings of Wusung River: of entrance by south channel to Yang Tze River. *Onnipec*, Commander W. B. Hoff: Report of gale, August 22, 1888. *Palos*, Lieut. Commander J. E. Craig; Lieut. F. M. Bostwick, navigator: Surveys of Pender-rock with sketch; Crichton group; general information Liau River; Newchwang; harbors in Murray Sound, Korea; Pechili Straits, China; Owari Rock; sunken rock in Chifu Harbor; rock in Ta-Lien-Whan Bay; tidal beacon and observations at Chemulpo, Korea; Port Arthur light. *Pinta*, Lieut. Commander J. S. Newell; Ensign D. F. Terrell, intelligence officer: Facilities for beaching vessels at Sitka, Alaska. *Quinnebaug*, Commander C. H. Davis, Lieut. C. C. Cornwell, navigator: Tracing of proposed plan of improvements in Bogaz channel, Alexandria, Egypt. *Sicatarra*, Commander J. McGowan; Lieut. C. P. Perkins, navigator: Soundings, coast of Brazil; tracing and chart while looking for shoal water; soundings, with track chart, southwest coast of Africa; use of oil in heavy weather. *Tallapoosa*, Commander F. W. Dickins; Lieuts. G. B. Harbor and C. F. Norton, navigators: General information about Buenos Ayres roads and harbor; Parana River; wrecks on English Bank; sunken wrecks removed in La Plata River; soundings, chart, etc., of unsuccessful search for French's Bank, La Plata River; information about La Plata River; Colonia Harbor. *Trenton*, Capt. N. H. Farquhar; Lieut. R. M. G. Brown, navigator: Soundings east coast of Patagonia; changes in depth of water in Panama

roads. *Vandalia*, Capt. C. M. Schoomaker; Lieut. J. C. Wilson, navigator: Buoyage in Honolulu Harbor. *Yantic*, Commander C. H. Rockwell: Abstract of log and charts, storm of June 6, 1889. Lieut. C. Laird: Reports relating to Vera Cruz, Mexico, with plans. Lieut. J. A. Norris, and Lieut. C. Laird: Magnetic observations Vera Cruz, Salina Cruz, and Coatzacoalcos, Mexico.

Valuable information has been received from masters of American and foreign vessels, American consuls, and various foreign offices and societies, to all of whom thanks are especially due.

#### LONGITUDE AND MAGNETIC PARTY.

The following account, kindly prepared at my request by Lieutenant Norris, gives in detail an account of this interesting and valuable work, the results of which are about ready for publication. This party is now preparing for further labor in the West Indies and on the Spanish Main, where the recent extension of the telegraph cables makes it possible to determine positions of importance. It is hoped that this work, so important to the Hydrographic Office and now fairly inaugurated, can be continued in the future without intermission.

The expedition for the telegraphic determination of longitudes in Mexico and Central America left New York for Vera Cruz in the steamer *City of Washington* on the 17th of November, 1888. The party was composed of the following naval officers, viz: Lieut. J. A. Norris, in charge, Lieut. Charles Laird, and Ensigns J. H. L. Holcombe and S. S. Wood. A complete outfit of instruments, etc., was carried, consisting of the following: Three portable transit instruments; 3 electric chronometers; 3 break-circuit chronometers; 2 sets cable telegraph instruments; 2 Siemens ink-writers; 1 magnetometer; 1 dip-circle; 1 set photographic apparatus; 2 wooden observatories; 2 astronomical observing tents; 2 army wall-tents; books, tools, stationery, etc.

The astronomical tents had been designed to take the place of the wooden observatories, in case it should be found impracticable to transport the latter overland.

A similar expedition in 1883, in charge of Lieut. Commander (now Commander) C. H. Davis, U. S. Navy, had determined the position of Vera Cruz in latitude and longitude, using as a starting point the position of Galveston, Tex., as established by the U. S. Coast and Geodetic Survey. The same expedition in 1884 fixed the position of La Libertad, in Salvador, on the Pacific coast of Central America. The object of the present expedition was to measure the difference of longitude between these two points. La Libertad had been established, using Panama as the initial point, and from the latter place had been measured various points on the west coast of S. America.

Vera Cruz and La Libertad are connected by the lines of the Central and S. American Cable Company, but it is not feasible to work this entire distance as circuit, consequently it was necessary to make observations at intermediate points. Proceeding from Vera Cruz to the cable lands at Coatzacoalcos, on the north side of Isthmus of Tehuantepec, thence a land line extends across the Isthmus to Salina Cruz on the south side, a distance of about 200 miles. Salina Cruz is connected with La Libertad by another cable. These two places (Coatzacoalcos and Salina Cruz) were selected as the observation points.

Upon arriving at Vera Cruz on December 1, it was found that means of communication with Coatzacoalcos were very imperfect. A small steamer made irregular trips, and had just started on one of them with the probability of not returning for at least three weeks. This delay was unexpected, but the time was utilized in getting the station ready for work. The transit pier used by Lieutenant-Commander Davis in 1883 was found and repaired; one of the wooden observatories was set up over it, and the instruments were mounted and adjusted. One of the astronomical tents was set up in a convenient spot as a magnetic observatory, and frequent magnetic observations were made. Lieutenant Laird, with Ensign Holcombe as his assistant, occupied this station, and on December 21 Lieutenant Norris and Ensign Wood left for Coatzacoalcos on the small steamer *Ibero*. The lack of accommodation and the dirty condition of this craft rendered the trip exceedingly disagreeable, but it was fortunately not long and the party arrived at Coatzacoalcos the next morning.

A suitable spot was selected and a transit pier erected as soon as possible, the

wooden observatory set up, the instruments mounted, and a wire extended to the telegraph office, about a third of a mile distant. All these preparations were completed by the 26th, but owing to bad weather it was not possible to make any satisfactory observations until the 29th. During the winter months the coast of Mexico is visited, at short intervals, by northers, which are accompanied by clouds and rain, rendering astronomical work impossible while they continue. The winds are not always violent, but they last from three days to two or three weeks. The work at Vera Cruz and Coatzacoalcos was much delayed by them, but satisfactory observations, with exchange of time signals, were obtained on the nights of December 29, 30, January 12, 15, 16, and 17. Observations for latitude were also made at Coatzacoalcos, and the position of the transit pier was referred to the light-house by triangulation.

On January 18 the instruments at Coatzacoalcos were dismantled and packed, and preparations made for crossing the Isthmus to Salina Cruz. Orders were given to the Vera Cruz party to proceed to Coatzacoalcos by the first opportunity, and on January 22 Lieutenant Norris and party proceeded up the Coatzacoalcos River in canoes. The wooden observatory was left at Coatzacoalcos and orders were given to Lieutenant Laird to send it, as well as his own, back to the United States.

Progress up the river was slow and a week was consumed in making the distance to Suchil, a small town about 100 miles from the starting point. Here a train of pack-mules had been engaged; the instruments, tents, etc., were transferred to them, and on January 31 the party set out. The first day's journey was over an exceedingly rough and muddy road, but after that it was much better. The progress was slow, owing to the weight of some of the packages, which prevented the bearers from making more than about 18 miles per day. On the evening of February 5 the party reached the town of San Geronimo, about 50 miles from Salina Cruz and the terminus of the railroad leading thereto. Owing to the small amount of traffic on the railway there are only three trains per week, which caused a delay of one day. On February 7, however, the party arrived in Salina Cruz with instruments, and at once commenced preparations for work.

Lieutenant Laird was fortunate in not having to wait long in Vera Cruz after completing his work, and his party arrived in Coatzacoalcos on February 1. The weather then was cloudy, as usual, and he had no opportunity for astronomical work until after the Salina Cruz party was ready, on February 9. He occupied the time in making magnetic observations. Finally the weather in Coatzacoalcos improved somewhat, and successful observations, with exchange of time signals, were made on February 10, 12, 13, 14, 15, and 16. Lieutenant Laird was then directed to proceed to Salina Cruz as soon as possible.

After latitude observations had been made Lieutenant Norris packed up his instruments and took passage to La Libertad on February 26 by the Pacific mail steamer *Clyde*, arriving at the latter place March 6, after a pleasant voyage.

It was found that the transit pier left by the party in 1884 at La Libertad had been displaced, so another site was chosen for the observatory and carefully referred to the original by triangulation. Everything was ready for work on March 9, but Lieutenant Laird, who had arrived in Salina Cruz on the 7th, found his chronograph out of order and was unable to work until the following night. The weather on the Pacific coast of Central America during the dry season is generally clear, and very favorable for astronomical work. The rainy season was now approaching, however, and some delay was experienced from clouds. Successful observations were made and time signals exchanged on March 12, 13, 14, 16, 17, and 18. This completed the measurement between Vera Cruz and La Libertad. As the latitude of La Libertad had been determined by the expedition of 1884, no further observations were made for that purpose, and on March 26 the La Libertad party embarked on the Pacific mail steamer *Starbuck* for San Juan del Sur, Nicaragua, near the terminus of the proposed ship-canal.

No difficulty or delay was experienced in this place, and being ready for work on March 30 successful observations were made on four nights, ending April 2. Two nights' latitude work followed, and then the instruments were packed for the last time and the party took passage for New York, via Panama, and arrived at Washington on April 25. Lieutenant Laird remained at Salina Cruz until April 15, when he took steamer to Acapulco and connected with the through steamer to Panama, finally arriving in Washington on May 16.

Throughout the entire trip the expedition was received with the utmost cordiality by the officials of the various Governments, who were only too anxious to assist in any manner possible. The officers of the cable company were of the greatest assistance and by their cheerful co-operation contributed much to the success of the work; without their aid comfortable quarters for the members of the expedition would have been frequently difficult if not impossible to obtain.



## GENERAL RECOMMENDATIONS.

The Hydrographic Office should be in a separate and specially constructed building, as its operations are largely mechanical. The necessity of having commodious and well-lighted rooms for draftsmen and engravers is obvious. The valuable copper plates should be close at hand for correction and printing. These and the archives require a fire-proof building. The present conditions, part of the office being in the Navy Department and another part in a detached building, are wasteful in time and material. A suitable building will cost \$200,000.

The Department should forestall loss of life and property and decrease underwriters' demands in regions where our trade is active or springing up (such, for instance, as on the Spanish Main) by extending its surveying operations to those localities and making trustworthy charts.

The vigorous work on and prospective completion of the Nicaragua Canal will undoubtedly stimulate our commerce, especially in the Pacific, which is full of dangers that will obstruct in some degree its free development. These considerations, added to the necessity of removing derelicts in proximity to the coast and ocean highways, make it important to have several small steamers constructed for special service, with a view also to use in time of war.

Power should be put on the plate-presses and there should be bought a lithographic press, an electrotyping plant, and a steam drying apparatus. These will cost about \$16,000.

A special item should be made in this year's estimates for a series of charts of China and the East, a series for the coasts of South America, and a series for the coast of Europe. The funds of the Hydrographic Office are largely swallowed up in the care and correction of the present stock of plates and charts and do not permit of a rapid enough advance to new ground. To commence will cost about \$30,000.

A special item should be made in this year's estimates for a Pilot Chart of the Pacific Ocean (\$15,000), and to keep the longitude and magnetic parties in the field permanently (\$6,000).

The branch office system should be extended at once to take in all shipping ports of importance, including those on the Great Lakes. Until Congress makes the appropriation large enough to do this properly specially-enlisted men could be assigned to the smaller ports, under the direction of the officers of the larger.

It would be greatly to the advantage of the office if the officers in charge of the branch offices could be allowed to make semi-annual visits along the sea-board within their special districts, and meet at least once a year at some central office to compare methods and exchange views. This would keep them more fully alive to their work, enable them to harmonize their methods, and to comprehend better the necessities of the sea-faring people with whom they have to deal.

In conclusion, I desire most earnestly to thank you for your unvarying patience in listening to my plans for the development of the Hydrographic Office, for your clear and liberal instructions in regard to its administration, and for the confidence, advice, and assistance, under all the pressure of your larger duties, which you have invariably given me on urgent occasions.

I wish also to express the heartiest appreciation of the cheerful and capable assistance rendered by Lieutenants Waring and Rush; Lieutenant McCarteney, in charge of sailing directions, and Lieut. F. H. Sherman; Lieutenant Coffman, in charge chart supply, and Ensign Whittelsey; Lieutenant Witzel, and Mr. Hayden, marine meteorolo-

gist, in charge of marine meteorology, and Ensign Rodman; and Mr. Littlehales, assistant in charge of chart construction; also by Lieutenant Downes at Boston, Ensign Blow at New York, Lieutenant Conway and Ensign Wilson at Philadelphia, Lieut. J. P. Parker at Baltimore, Lieutenant Barroll at Norfolk, Ensign Watters at New Orleans; Lieutenant McIntosh at San Francisco, and Ensign Terrell at Portland, Oregon.

The thanks of the office, due to many, should be especially extended to Chief Engineer Williamson, superintendent State, War, and Navy Department Building, and to Assistant Engineer Baird, his capable and obliging aid; to Captain Brian, in charge of printing, and Mr. J. E. Bright, foreman job-room, Government Printing Office; to the Department of State; to the Coast and Geodetic Survey; the Light-House Board; Bureau of Navigation, Treasury Department; Geological Survey; Smithsonian Institution; Fish Commission; the Government Printing Office; the Bureau of Engraving and Printing; and to all foreign hydrographic offices and marine boards. The press and the maritime bodies of the coast have always given willing and most efficient assistance.

Respectfully submitted.

G. L. DYER,  
*Lieutenant, U. S. Navy, Hydrographer.*

The CHIEF OF BUREAU OF NAVIGATION.

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DIVISION OF CHART CONSTRUCTION,  
*Hydrographic Office, July 1, 1889.*

SIR: I have the honor to report upon the work of chart-making and its kindred branches for the fiscal year ending June 30, 1889.

GENERAL SAILING CHARTS.

The completion of the four general sailing charts of the South Atlantic Ocean extended this series, on a scale of six-tenths of an inch to the degree of longitude, over the whole of the commercial world. The style and execution of these last charts are in keeping with those of the rest of the series. The principal sea lights, or those that a vessel would be likely to make on first falling in with the land, are alone shown; and, in general, the more minute details which are to be found on charts of larger scale are not indicated. Many of the dangers which have hitherto appeared on charts of the South Atlantic Ocean, based upon vague reports of former navigators, and which have either been unsuccessfully searched for in modern times, or the existence of which there is strong reason to disbelieve, have been omitted.

GENERAL COAST CHARTS.

This series of charts, on a scale of  $4\frac{1}{2}$  inches to the degree of longitude, has been extended by the completion of charts of the Gulf of St. Lawrence and the Flemish Cap, on the north, and by one of the Gulf coast of the United States from Key West to the mouths of the Mississippi River, on the south. There are now in course of construction charts of this series covering the coasts from the mouths of the Mississippi River to the mouth of the Rio Grande, Gulf of Mexico, from Panama to Cape San Francisco, from Cape San Francisco to Lobos de

Afuera, and from Paita to Callao, on the west coast of South America.

The series of general coast charts, on a scale of 2.7 inches to the degree of longitude, covering the coasts and islands from Singapore to Hong-Kong, will be extended to the southward by a chart covering the region from Singapore to Batavia and the Strait of Suuda. This chart will be published in August, 1889. Within its area are twenty-five reported dangers to navigation, which are doubtful, either in existence or position. A list of these has been submitted, with the request that it be forwarded to the Asiatic squadron, in order that the existence and position of these dangers may be either confirmed or disproved.

#### SPECIAL COAST CHARTS.

The series of special coast charts, on a scale of one-fourth of an inch to the minute of middle latitude, formerly covering the coasts of Nova Scotia and New Brunswick, has been extended so as to cover those of Quebec and of South and West Newfoundland, and the river St. Lawrence from its mouth to Quebec. The work of extending this series so as to envelope the whole of Newfoundland is well advanced.

The first of the series of special coast charts, from San Diego to San Quentin Bay, resulting from the survey of the U. S. S. *Ranger*, at present in progress below the boundary of the United States, has been published; and the second, from San Quentin Bay to Lagoon Head, is ready for engraving.

A chart of Sunda Strait, upon this scale, has also been published, and affords a means of entering upon the region covered by the East Indian series of general coast charts which extends as far as Hong-Kong.

#### GREAT CIRCLE SAILING CHARTS.

During the year Mr. Gustave Herrle, chief draftsman, has devised, for the purposes of great circle sailing, gnomonic charts of the North Pacific, South Pacific, and Indian Oceans. These charts have now been engraved on copper and published. They render complete the set of great circle sailing charts of all the great oceans. That of the North Pacific is particularly useful for the ocean travel between the United States and the China Sea, while those of the Indian and South Pacific provide for a long-felt need in the New Zealand and Australian trade.

Those who use these charts in connection with a knowledge of the prevailing winds and currents of the oceans gain daily advantage in the great sea-routes. Sailing-ships continue to carry much of the New Zealand trade, and they make the outward voyage from the United States and British ports by the Cape of Good Hope, and the return voyage around Cape Horn. This particular course is explained by the presence of the well-known westerly winds in this latitude. The great circle track on this voyage is much shorter than that on a rhumb-line, and the difficulty hitherto experienced by sea captains in working out such tracks is now obviated. These charts are also arranged for the simple and easy manipulation of composite tracks, which can be used when the great circle track would carry the ship into too high a latitude.

#### HARBOR AND SPECIAL CHARTS.

The work upon the plans of harbors and charts of special localities, on large scales, as well as the work upon the more general charts, and also upon miscellaneous plates, is set forth in detail in the following tables;

*Charts engraved on copper, and published during the fiscal year ending June 30, 1889.*

General locality.	Catalogue number.	Title.	Scale.	Size.	When begun.	When finished.
Newfoundland.....	1093	Great Jarvis Harbor.....	M. = 4.0	10 by 12	Apr., 1888	July, 1888
Nova Scotia.....	1094	Pugwash Harbor.....	M. = 3.0	19 by 21	Apr., 1888	July, 1888
Santon Islands.....	1100	Pangnash Bay.....	M. = 6.0	19 by 21	June, 1888	Aug., 1888
Gulf of St. Lawrence.....	1103	D. long. = 4.5	M. = 3.0	53 by 58	May, 1887	Oct., 1888
Prince Edward Island.....	1068	Hillsborough Bay and Charlottetown Harbor.....	M. = 4.0	20 by 21	Sept., 1887	Aug., 1888
Newfoundland.....	1073	Willington Harbor.....	M. = 3.0	11 by 15	June, 1888	Sept., 1888
Prince Edward Island.....	1065	Crapaud Road.....	M. = 4.0	15 by 18	May, 1888	Sept., 1888
Hawaiian Islands.....	1096	Hilo Bay.....	M. = 2.0	15 by 20	Jan., 1888	Sept., 1888
Nova Scotia.....	1097	Scatar Island and Menadon Passage.....	M. = 2.0	19 by 23	Apr., 1888	Nov., 1888
Do.....	1098	Amet Sound.....	M. = 3.0	18 by 16	Mar., 1888	Oct., 1888
Do.....	1099	Xerigomish Harbor.....	M. = 3.0	18 by 18	Aug., 1888	Oct., 1888
Lower California.....	1100	Santa Rosalia Bay.....	M. = 3.0	19 by 24	Oct., 1887	Dec., 1888
New Brunswick.....	1081	Shediac Harbor.....	M. = 1.6	21 by 2	Aug., 1887	Nov., 1888
Newfoundland.....	1101	South coast of Newfoundland.....	M. = 3.0	9 by 15	July, 1888	Nov., 1888
Nova Scotia.....	1108	Liverpool Bay and Port Mouton.....	M. = 1.6	21 by 2	Jan., 1888	Dec., 1888
Magdalen Islands.....	1107	Amherst and Grand Entry Harbors.....	M. = 15.25	37 by 37	Jan., 1888	Nov., 1888
Quebec.....	1108	South coast of Quebec.....	M. = 0.0	12 by 16	Oct., 1888	Nov., 1888
Isabella Islands.....	1113	Port Nelson, Rum Cay.....	M. = 9.0	20 by 26	Oct., 1888	Nov., 1888
Newfoundland.....	1114	St. John's Harbor.....	M. = 1.0	17 by 20	Aug., 1888	Nov., 1888
Lower California.....	1115	Blanca and Falsa Bays.....	M. = 2.0	21 by 26	Dec., 1887	Dec., 1888
Nova Scotia.....	1116	Country Harbor.....	M. = 15.0	27 by 40	Mar., 1887	Dec., 1888
Newfoundland.....	1104	West and south coasts of Newfoundland.....	M. = 4.0	22 by 29	Nov., 1887	Dec., 1888
Chili.....	1117	Valparaiso Harbor.....	M. = 1.0	17 by 19	Oct., 1888	Dec., 1888
Lower California.....	1118	Playa Maria Bay to Rosalia Point.....	M. = 0.6	25 by 31	Dec., 1879	Dec., 1888
South Pacific Ocean.....	1121	Easter Island.....	M. = 0.6	25 by 31	Dec., 1879	Dec., 1888
South Atlantic Ocean.....	1122	South Atlantic Ocean, Sheet I, lower part.....	M. = 1.5	30 by 37	Mar., 1880	Jan., 1888
Do.....	1121	South Atlantic Ocean, Sheet II, upper part.....	M. = 4.0	24 by 29	Jan., 1888	Mar., 1889
West India.....	1094	Island of Antigua.....	M. = 4.5	33 by 40	Nov., 1887	Jan., 1889
Nova Scotia.....	1124	Whitehaven.....	M. = 2.0	25 by 31	Sept., 1885	Jan., 1889
Gulf of Mexico.....	1125	Key West to the Mississippi River.....	M. = 0.6	30 by 31	Dec., 1879	Jan., 1889
North Pacific Ocean.....	1127	Great Circle Sailing Chart of the North Pacific Ocean.....	M. = 2.0	30 by 33	Mar., 1888	Jan., 1889
South Atlantic Ocean.....	1133	St. Anne Harbor and Great Bras d'Or.....	M. = 2.0	21 by 26	May, 1888	Jan., 1889
Cape Breton Island.....	1134	Slip Harbor and adjacent anchorage.....	M. = 2.0	0 by 11	Jan., 1888	Feb., 1889
Nova Scotia.....	1135	Salmon Island anchorage.....	M. = 2.0	13 by 16	Dec., 1888	Feb., 1889
Esanor.....	1129	Carranza River.....	M. = 2.0	16 by 22	Jan., 1887	Feb., 1889
Do.....	1129	Santa Elena Bay.....	M. = 2.0	25 by 40	June, 1887	Feb., 1889
Indian Ocean.....	1129	Great Circle Sailing Chart of Indian Ocean.....	M. = 1.5	8 by 10	Jan., 1889	Feb., 1889
North Atlantic Ocean.....	1137	Mantis Bay.....	M. = 4.5	17 by 22	Nov., 1888	Feb., 1889
Nova Scotia.....	1138	The Flemish Cap (supplement to Chart No. 980).....	M. = 2.0	17 by 23	June, 1888	Feb., 1889

Charts engraved on copper, and published during the fiscal year ending June 30, 1889—Continued.

General locality.	Catalogue number.	Title.	Scale.	Size.	When begun.	When finished.
Newfoundland.....	1105	West coast of Newfoundland.....	D. lat. = 15.6	by 38	June, 1887	May, 1889
South Atlantic Ocean.....	1130	South Atlantic Ocean, Sheet I, upper part.....	D. long. = 0.6	by 29	Dec., 1879	May, 1889
Nova Scotia.....	1141	Caribon Harbor.....	M. = 3.0	by 26	Oct., 1888	Mar., 1889
Hawaiian Islands.....	1142	Pearl River and Lucho.....	M. = 5.0	by 35	June, 1888	Mar., 1889
Eastern Archipelago.....	1143	Sunda Straits and approaches.....	D. lat. = 15.0	27 by 42	Nov., 1887	Mar., 1889
Chili.....	1144	Port Patillon and Patache Cove.....	M. = 2.0	13 by 17	Feb., 1889	Mar., 1889
Do.....	1145	Algarrobo Road.....	M. = 3.0	12 by 14	Mar., 1889	Mar., 1889
South Pacific Ocean.....	1128	Great Circle Sailing Chart of the South Pacific Ocean.....	D. lat. = 15.35	25 by 40.3	Apr., 1886	Apr., 1889
Canada.....	1110	Gulf of St. Lawrence, Anticosti Island to Point de Monta.....	M. = 4.0	by 34	Oct., 1887	May, 1889
Peru.....	1146	Salinas and Chica Bay.....	M. = 2.0	13 by 13	Mar., 1889	Apr., 1889
Chili.....	1147	Chinabuya Road and Pabellon de Pica.....	M. = 2.0	10 by 20	Feb., 1889	Apr., 1889
Do.....	1148	Liquique Harbor.....	M. = 2.0	18 by 25	Jan., 1889	May, 1889
Nova Scotia.....	1149	Ponquet and Tracadie Harbors.....	D. lat. = 13.0	28 by 38	June, 1887	Apr., 1889
Lower California.....	1109	San Diego to San Quentin Bay.....	D. lat. = 15.25	22.0 by 34	Feb., 1888	May, 1889
Gulf of St. Lawrence.....	1151	Anticosti Island and adjacent coasts of Quebec.....	M. = 3.0	12.0 by 21	June, 1888	May, 1889
Nova Scotia.....	1152	Wallace Harbor.....	M. = 0.0	14.3 by 18	Apr., 1889	May, 1889
Chili.....	1153	Antofagasta Road.....	M. = 1.5	7.3 by 8	Feb., 1889	May, 1889
Ecuador.....	1154	Capo Pasado anchorage.....	M. = 1.0	5.8 by 8	Feb., 1889	May, 1889
Do.....	1155	Emeraldas River.....	M. = 1.0	7.3 by 8	Feb., 1889	May, 1889
Peru.....	1156	San José de Lambayeque Road.....	M. = 2.0	3.8 by 8	Apr., 1889	May, 1889
Do.....	1157	Eten Point anchorage.....	M. = 4.0	16.0 by 20.6	May, 1888	May, 1889
West Indies.....	1158	Vieux Fort Bay, St. Lucia.....	M. = 0.5	26 by 37	May, 1889	May, 1889
Gulana.....	1159	Months of Demerara and Essequibo Rivers.....	M. = 3.0	13 by 16	May, 1889	May, 1889
Chili.....	1160	Mejillones del Norte and Buena Cove.....	M. = 6.0	8 by 10	May, 1889	May, 1889
Peru.....	1161	Port Chica.....	M. = 5.0	15 by 19	Apr., 1889	June, 1889
Bahama Islands.....	1162	Great Stirrup Cay.....	M. = 7.5	18 by 19	May, 1889	June, 1889
Nicaragua (west coast).....	1163	Brito Harbor.....	M. = 4.0	19 by 26	Aug., 1888	June, 1889
Prince Edward Island.....	1150	Murray Harbor.....	M. = 4.0	19 by 26	Aug., 1888	June, 1889

NOTE.—The scale of the chart is expressed in inches by the use of the abbreviations, D. long.; the length of a degree of longitude on the equator; D. lat., the length of a degree of the meridian in the middle latitude of the chart; and M., the length of a nautical mile. The size of the chart is expressed in inches, measuring between the extreme edges of the border.

*Miscellaneous plates finished during the fiscal year.*—Stereographic projection arranged for the graphical solution of spherical triangles, by Commander C. D. Sigsbee, U. S. Navy. [In order to make this publication exact a photo-lithographic transfer of the plate should be taken, and the copies should be printed from stone to avoid the distortion incident to plate printing.]

Letter-head for Hydrographic Office.

Legend for upper left-hand corner of Hydrographer's official correspondence paper.

Letter-head for Bureau of Equipment and Recruiting.

Steel die for stamping penalty stamp for office of Secretary of Navy.

Steel plate of standard compasses and other subjects to be taken up on steel rolls for the purpose of transferring them to the copper plates. [The taking up of these subjects on the bank-note rolls was done at the Bureau of Engraving and Printing.]

*Charts which have received important corrections and additions amounting to a redrawing of a portion of the chart.*

General locality.	Catalogue number.	Title.	Character of corrections.
Samoa Islands .....	92	Apolima Island, and harbors of Oafonu, Fungasar, and Aur.	Added plan of Hübner Bay.
Samoa Islands .....	95	Harbors of Apia, Falealili, and Matautu.	New plan of Apia Harbor.
Indian Ocean .....	854a	Indian Ocean, northern portion, western sheet.	Coast line, islands, and aids to navigation.
Do .....	854b	Indian Ocean, northern portion, eastern sheet.	Do.
North Atlantic Ocean ..	941	Halifax to New York .....	Redelineation of 50-fathom banks, new compasses, additional aids to navigation.
Do .....	980	The Grand Bank of Newfoundland .....	Do.
Do .....	21	North Atlantic Ocean, sheet I, lower part	Engraving extensively recut.
Do .....	22	North Atlantic Ocean, sheet II, lower part.	Do.
Do .....	22a	North Atlantic Ocean, sheet II, upper part.	Do.
China Sea .....	797	China Sea, southern portion, western sheet.	Coast line and hydrography new around Borneo and Sumatra.

#### ELECTROTYPING AND PRINTING.

During the year there were received two electrotypes altos and three bassos. Thirty-four blank plates were purchased, and twenty-two were made by scouring down and polishing condemned plates upon which the engraving had become obsolete. Three engraved plates were withdrawn from use. The number of copper and steel chart plates available for printing is 505. From these were printed 20,835 copies of charts for issue, and 602 proofs. There are also 103 miscellaneous engraved plates, from which 1,050 copies were printed. The total number of accepted copies of plates printed is 21,885, a number somewhat greater than ever before printed at the Hydrographic Office in one year. In addition, the force of printers was employed in miscellaneous printing and stamping as follows:

Official letter paper .....	reams ..	27½
Official note paper .....	do .....	10
Official cards .....		1,030
Official envelopes .....		11,010

#### Summary.

	Total to June 30, 1888.	Finished during the year.	Condemned during the year.	Total to June 30, 1889.
Engraved chart plates .....	441	65	2	505
Miscellaneous plates .....	100	3		103
Altos of engraved chart plates .....	128	2	1	129
Bassos of engraved chart plates .....	71	3	1	73
Impressions of engraved plates for issue .....				21,885
Proofs of engraved plates for office use .....				602

## DEEP-SEA SOUNDINGS.

A knowledge of the configuration of those parts of the solid surface of the earth that lie beneath the waters of the oceans has been of commercial importance in laying telegraph cables, and it is of scientific importance as an aid to the investigation of the physical phenomena of the ocean. All reliable results upon this subject have been embodied in six sheets of the North Atlantic Ocean, four of the South Atlantic Ocean, and six sheets of the Indian Ocean. Continuing this work in the Pacific Ocean, thirty-five sheets have been outlined on a scale of  $1\frac{1}{2}$  inches to the degree of longitude, and a memorandum has been prepared showing where future work should proceed in order to do the greatest good. The Record of Deep Soundings, in which is entered those desirable particulars which should not be shown on the sounding sheets themselves, has been kept. Important deep-sea sounding work has been received during the year from the sources indicated in the following table:

Ship.	Commander.	Locality.
U. S. S. Trenton.....	N. H. Farquhar.....	East coast of Patagonia.
U. S. S. Palos.....	Jos. E. Craig.....	Korea.
U. S. S. Alliance.....	G. W. Pigman.....	South Atlantic (east coast of South America).
U. S. S. Juniata.....	W. C. Wise.....	North Pacific.
U. S. F. C. S. Albatross.....	Z. L. Tanner.....	Gulf of Alaska, coast of Mexico, and Galapagos Islands.
U. S. S. Swatara.....	John McGowan.....	South coast of Africa.
H. M. S. Myrmidon.....	.....	Arafura and Banda Seas.
H. M. S. Dart.....	.....	Coral Sea.
Br. Bk. Time.....	David Lloyd.....	Coast of Brazil.
S. S. Iowa.....	— Owens.....	Bank of Newfoundland.
Cable Co's S. S. Amber.....	.....	Southwest coast of Africa.
Baker Salvage Co.....	V. L. Cottman.....	Off entrance to Chesapeake Bay.

### THE NEED FOR CARRYING ON THE PROCESS OF RE-ENGRAVING THE ENGRAVED PLATES AS A SUPPLEMENTARY WORK.

The need for these nautical chart plates is perennial. The plates are the most valuable of them extend over well-surveyed waters, and the chart, once constructed, should be enduring in order to save the expense of frequent re-engravings. The failure to provide for the more important cases will, in the end, constitute one of the most important drawbacks to the securing of permanent charts, and the economy practiced in their construction. This important question has now been carefully weighed.

A well-engraved plate furnishes five thousand copies before it is said to be worn out, but after five hundred impressions are taken it shows signs of serious wear. It is then in a critical condition. It can be re-engraved at this stage at moderate expense, and the impressions will be as clear again, but if allowed to go much beyond the difficulty in re-engraving the new and the old portions of the work becomes great. It can only be well done by the application of great skill and the expenditure of much time.

### THE INVESTIGATION OF THE VARIATION OF THE COMPASS.

The collection of observed values of the magnetic elements of the earth has been continued. Special attention has been paid to the magnetic declination or the variation of the compass, as this is the element with which navigators are most concerned, and which must be known with the greatest accuracy.

in order to assign the correct direction of the magnetic meridian on hydrographic charts.

A chart of the lines of equal magnetic variation over the peninsula of Lower California and the adjacent waters of the Pacific Ocean and the Gulf of California for the year 1838, published in Notice to Mariners No. 52, of 1838, was made principally from the magnetic work of Lient. C. F. Pond, U. S. Navy, of the U. S. S. *Ranger*, Commander F. A. Cook, U. S. Navy, commanding, and from the observations of the U. S. Coast and Geodetic Survey in 1830.

The results of the investigations carried on for this purpose, and of those made in connection with the work on the charts of South American waters, are summarized in the following equations, in which  $V$  represents the variation for any time, and  $t$  the time expressed in years and fractions of a year counted from 1850, plus when forward, minus when backward :

General locality.	Name of place.	Equation giving variation for any year.	Probable error of values computed from this equation.
California.....	San Diego .....	$V = -11.847 - 1.099 \sin^2 t - 0.754 \cos \frac{1}{2} t$	$\pm 11'$
Lower California.	Lagoon Head .....	$V = -9.845 - 1.280 \sin^2 t - 1.510 \cos \frac{1}{2} t$	$\pm 09'$
Do.....	Magdalena Bay .....	$V = -7.484 - 1.460 \sin^2 t - 2.739 \cos \frac{1}{2} t$	$\pm 35'$
Mexico.....	San Blas .....	$V = -6.597 - 0.558 \sin^2 t - 2.761 \cos \frac{1}{2} t$	$\pm 28'$
Do.....	City of Mexico .....	$V = -5.522 + 0.027 \sin t + 3.088 \cos t$	$\pm 14'$
United States of			
Colombia.....	Panama .....	$V = -6.540 + 1.367 \sin 1.8 t + 0.105 \cos 1.8 t$	$\pm 13'$
Do.....	Cartagena .....	$V = -3.268 + 3.566 \sin 0.6 t - 1.818 \cos 0.6 t$	$\pm 19'$
South Pacific.....	Galapagos Is .....	$V = -7.491 + 0.069 \sin 1.5 t - 1.910 \cos 1.5 t$	$\pm 28'$
Ecuador.....	Puna and Guayaquil.	$V = -8.459 + 0.0204 t + 0.0001 t^2$	$\pm 10'$
Peru.....	Paita .....	$V = -4.404 + 0.384 \sin \frac{1}{2} t - 4.692 \cos \frac{1}{2} t$	$\pm 06'$
Do.....	Callao .....	$V = -8.654 + 0.264 \sin \frac{1}{2} t - 1.712 \cos \frac{1}{2} t$	$\pm 09'$
Do.....	Arica .....	$V = -9.401 + 0.300 \sin \frac{1}{2} t - 1.442 \cos \frac{1}{2} t$	$\pm 06'$
Chili.....	Coquimbo .....	$V = -11.865 - 0.656 \sin 1.2 t - 2.645 \cos 1.2 t$	$\pm 21'$
Do.....	Valparaiso .....	$V = -12.639 + 0.047 \sin t - 3.124 \cos t$	$\pm 18'$
Do.....	Concepcion .....	$V = -11.940 - 0.765 \sin \frac{1}{2} t - 4.838 \cos \frac{1}{2} t$	$\pm 22'$
Uruguay.....	Montevideo .....	$V = -10.261 + 3.287 \sin t - 0.152 \cos t$	$\pm 12'$
Brazil.....	Rio Janeiro .....	$V = +1.814 + 6.655 \sin t - 1.825 \cos t$	$\pm 25'$
Do.....	Bahia .....	$V = -0.471 + 8.150 \sin \frac{1}{2} t + 7.424 \cos \frac{1}{2} t$	$\pm 28'$
Do.....	Pernambuco .....	$V = -0.648 + 7.477 \sin \frac{1}{2} t + 8.427 \cos \frac{1}{2} t$	$\pm 24'$
West Indies.....	Bridgetown .....	$V = +2.079 + 1.737 \sin 1.2 t + 1.300 \cos 1.2 t$	$\pm 16'$
Do.....	Fort-de-France .....	$V = +2.726 + 2.926 \sin \frac{1}{2} t + 1.528 \cos \frac{1}{2} t$	$\pm 19'$

By differentiating the equations in the preceding table and converting the circular measure into minutes of arc, the following equations, giving the rate for any year, have been formed :

General locality.	Name of place.	Equation giving annual rate for any year.	Annual rate for 1850.
California.....	San Diego .....	$dV = -1.725 \cos \frac{1}{2} t + 1.190 \sin \frac{1}{2} t$	decreasing $0'.6$
Lower California.	Lagoon Head .....	$dV = -1.928 \cos \frac{1}{2} t + 2.272 \sin \frac{1}{2} t$	do $0'.8$
Do.....	Magdalena Bay .....	$dV = -2.197 \cos \frac{1}{2} t + 4.000 \sin \frac{1}{2} t$	do $2'.1$
Mexico.....	San Blas .....	$dV = -0.835 \cos \frac{1}{2} t + 4.129 \sin \frac{1}{2} t$	do $2'.9$
Do.....	City of Mexico .....	$dV = +0.028 \cos t + 3.233 \sin t$	do $2'.5$
United States of			
Colombia.....	Panama .....	$dV = +2.576 \cos 1.8 t - 0.198 \sin 1.8 t$	do $0'.7$
Do.....	Cartagena .....	$dV = +2.240 \cos 0.6 t + 1.142 \sin 0.6 t$	do $0'.7$
South Pacific.....	Galapagos Is .....	$dV = +0.108 \cos 1.5 t + 3.000 \sin 1.5 t$	do $3'.6$
Ecuador.....	Puna and Guayaquil.	$dV = +1.206 + 0.012 t$	do $1'.7$
Peru.....	Paita .....	$dV = -0.322 \cos 0.8 t + 3.930 \sin 0.8 t$	do $2'.3$
Do.....	Callao .....	$dV = -0.221 \cos 0.8 t + 1.434 \sin 0.8 t$	do $0'.9$
Do.....	Arica .....	$dV = -0.471 \cos 1.5 t + 2.264 \sin 1.5 t$	do $2'.2$
Chili.....	Coquimbo .....	$dV = -0.824 \cos 1.2 t + 3.323 \sin 1.2 t$	do $1'.9$
Do.....	Valparaiso .....	$dV = +0.049 \cos t + 3.271 \sin t$	do $2'.1$
Do.....	Concepcion .....	$dV = -0.601 \cos \frac{1}{2} t + 3.878 \sin \frac{1}{2} t$	do $1'.4$
Uruguay.....	Montevideo .....	$dV = +3.970 \cos t + 0.159 \sin t$	do $3'.2$
Brazil.....	Rio Janeiro .....	$dV = +9.062 \cos t + 1.911 \sin t$	increasing $8'.2$
Do.....	Bahia .....	$dV = +8.084 \cos \frac{1}{2} t - 7.363 \sin \frac{1}{2} t$	do $2'.0$
Do.....	Pernambuco .....	$dV = +7.828 \cos \frac{1}{2} t - 8.823 \sin \frac{1}{2} t$	do $0'.5$
West Indies.....	Bridgetown .....	$dV = +2.182 \cos 1.2 t - 1.633 \sin 1.2 t$	do $0'.3$
Do.....	Fort-de-France .....	$dV = +2.808 \cos \frac{1}{2} t - 1.476 \sin \frac{1}{2} t$	do $1'.4$



These results were computed by Mr. John S. Siebert, who has shown a commendable zeal in his work.

The observations for magnetic variation, dip, and intensity lately completed by Lieutenants Norris, Laird, and Holcombe and Ensign S. S. Wood, U. S. Navy, of the Central American Telegraphic Longitude Expedition, will furnish valuable results at several additional stations in Mexico and Central America.

#### THE RECORD OF LONGITUDES.

Preparations have been begun for the publication, in serial form, of this work which contains much of permanent value to navigators, chart-makers, and others working in the same field. In connection with the compilation of this record it is desirable that the note-books of officers while serving as navigators of vessels of war should be examined and that the valuable data contained therein should be used, where practicable, for the improvement of those accepted results which are known to be capable of improvement in the light of additional observations.

#### SCIENTIFIC BOOKS AND PAPERS PREPARED.

*The development of great circle sailing.*—The manuscript of this book was handed to the printer in September, 1888. It has for its object the furtherance of the general effort of the Bureau of Navigation to keep pace with the progress in the nautical sciences, and consists of an exposition of those graphical and analytical methods which embody cardinal principles in the development of methods for the navigation of the great circle track. In it publicity for the first time is given to several of the most convenient and useful methods yet devised. While presenting the state of the science of great circle sailing and giving a clear idea of each method, reference is made to where more extended information on these subjects can be found.

*New table of meridional parts.*—For the more accurate projection of charts a table of meridional parts or increased latitudes has been computed upon Clark's determination of the compression of the terrestrial spheroid in 1880, which is  $c = \frac{1}{293.465}$ . The formula used for the practical computation is

$$M = 7915'.7044558 \log \tan \left( 45^\circ + \frac{\varphi}{2} \right) \\ - (23'.38871 \sin \varphi + 0.053042 \sin^3 \varphi + 0.000216523 \sin^5 \varphi + \dots)$$

*The use of oil.*—Attempts have been made to arrive at a scientific explanation of the calming action of oil upon broken water and a paper embodying the results of the studies into the subject up to the present time has been published. It gives an explanation of the various kinds of wave motion that can take place in water; a more particular account of the structure of sea waves with a view to impart an idea of the forces to be overcome by the calming effect; an account of how waves are formed at sea and why they "break"; a rigid explanation of expansion of oil on water; an explanation of the action of the oily film to suppress such "breaking" as may be going on when the film is spread, and how, after the film is spread, the mere act of breaking tends to suppress itself; an account of the action of the film as a shield to prevent the derangement of the wave mechanism; and an explanation of the growth of sea waves by the building-up process carried on by smaller waves, and why the oil film prevents such growth.

*Charts in process of construction, unfinished at the close of the fiscal year.*

General locality.	No.	Preliminary title.	Scale.	Size.	When begun.	Remarks.
Eastern Archipelago.....	5p	Batavia to Singapore.....	D. long. = 2.7	24.5 by 34.5	Oct., 1885	Will be published in Aug., 1889.
Newfoundland.....	20p	Northeast Newfoundland.....	D. lat. = 15.0	25 by 32.7	May, 1887	Ready for lettering engraver.
Central America.....	41p	Gulf of Honduras.....	D. lat. = 13.0	21 by 28	Aug., 1887	Will be published in July, 1889.
Canada.....	52p	River St. Lawrence, River Saguenay to Quebec.....	D. lat. = 13.0	22 by 27	Nov., 1887	Will be published in Aug., 1889.
Newfoundland.....	59p	Northeast Newfoundland.....	D. lat. = 13.0	24 by 39.5	Dec., 1887	Ready for topographical engraver.
Eastern Archipelago.....	64p	Singapore and Rhio Straits.....	M. = 1	28 by 36.5	Jan., 1888	Ready for lettering engraver.
Canada.....	79p	Sheet Harbor.....	M. = 2	30 by 25.3	Apr., 1888	In hands of topographical engraver.
Do.....	85p	River St. Lawrence, Point de Monts to River Saguenay.....	D. lat. = 15.0	22.5 by 29	May, 1888	Will be published in July, 1889.
Gulf of Mexico.....	89p	Mississippi River to Rio Grande.....	D. long. = 4.5	32 by 43	June, 1888	Do.
Gulf of St. Lawrence.....	92p	Mouths of Demerara and Essequibo rivers.....	M. = 1.5	28 by 39	July, 1888	Ready for topographical engraver.
Delaware River.....	97p	Curacotte, Shippegan, and Miscou harbors.....	M. = 1.5	25 by 34	Aug., 1888	Speed course not adopted. Drawing not used.
Canada.....	99p	Speed Course.....	M. = 2.0	27.3 by 29	Aug., 1888	In hands of lettering engraver.
Do.....	100p	Gut of Canoe.....	M. = 1.0	26 by 24	Nov., 1888	Ready for topographical engraver.
Do.....	101p	Great Bras d'Or.....	M. = 1	30 by 34.5	Sept., 1888	In hands of draftsman.
Do.....	105p	Madame I. and Lennox Passage.....	M. = 2	38 by 25	Sept., 1888	Do.
Do.....	105p	Quebec Harbor.....	M. = 6	23 by 39	Apr., 1889	Do.
Ecuador.....	107p	Guayaquil River.....	M. = 1	24 by 41	Nov., 1889	Do.
South America.....	108p	Panama to Cape San Francisco.....	D. long. = 4.5	26 by 41.5	Nov., 1889	Ready for topographical engraver.
Lower California.....	109p	San Quentin Bay to Lagoon Head.....	D. lat. = 15.0	29 by 36	Dec., 1889	Do.
South America.....	111p	Cape San Francisco to Lobos de Afuera.....	D. long. = 4.5	36.5 by 28	Dec., 1889	Do.
Do.....	113p	Bahia Blanca to Rio Negro.....	D. lat. = 1	35 by 21.5	Jan., 1890	Do.
Canada.....	114p	Miramichi Bay.....	M. = 1.5	22.5 by 34.7	Mar., 1890	In hands of draftsman.
South America.....	115p	Port Belgrano.....	M. = 1	35.5 by 29	Jan., 1890	In hands of topographical engraver.
West Indies.....	125p	Port Caestries, St. Lucia.....	M. = 7.5	21.7 by 26.7	Jan., 1890	Ready for topographical engraver.
South America.....	126p	Palta to Callao.....	M. = 4.5	41 by 27	Mar., 1890	In hands of draftsman.
Canada.....	127p	Pasamunquidly Bay.....	M. = 1	33 by 29	Mar., 1890	In hands of lettering engraver.
West Indies.....	130p	Kingstown, Great Head, and Calliqua bays.....	M. = 1	20 by 16	Mar., 1890	In hands of draftsman.
Java.....	133p	Batavia Road.....	M. = 1	37.5 by 25	Apr., 1890	Not yet begun.
Malay Peninsula.....	134p	Singapore Roads.....	M. = 6.0	25 by 34	May, 1890	In hands of draftsman.
Peru.....	136p	Arica Harbor.....	M. = 14	30.5 by 32.5	May, 1890	Do.
Portugal.....	137p	Tagus River and Lisbon.....	M. = 2	29 by 27	May, 1890	Ready for topographical engraver.
Newfoundland.....	138p	Port Saunders, Kenpel, and Hawke harbors.....	M. = 4	15 by 20	June, 1890	In hands of draftsman.
Hawaiian Islands.....	141p	Harbors and anchorages in the Hawaiian Islands.....	M. = 4	16.5 by 22	June, 1890	Do.
Brazil.....	142p	Ceara Bay.....	M. = 4	16.5 by 22	June, 1890	Do.

*Charts receiving important corrections and additions, unfinished at the end of the fiscal year.*

General locality.	Catalogue No.	Title.	Character of corrections.
British America .....	903	Juan de Fuca Strait to Queen Charlotte Islands.....	Extensive changes in shore-line and hydrography, resulting from recent surveys.
Do .....	904	Queen Charlotte Islands, Hecate Strait, and Dixon entrance.	Do.
Chili .....	446	Channels between Magellan Strait and the Gulf of Trinidad.	Do.
Do .....	447	Channels between the Gulfs of Trinidad and Peñas, lower part.	Do.
Do .....	447a	Channels between the Gulfs of Trinidad and Peñas, upper part.	Do.
Hawaiian Islands.....	867	South side of Oahu.	Do.
North Atlantic Ocean.....	21a	North Atlantic Ocean. Sheet I, upper part.	Addition of Hudson's Bay.
Irish Channel.....	536a	Irish Channel, northern portion.	Extensive changes in aids to navigation and in hydrography.
Do .....	536b	Irish Channel, southern portion.	Do.
China Sea.....	797	China Sea, southern portion, western sheet.	Changes in shore lines and hydrography of Borneo and Sumatra.

The following table shows the number of men employed during the year upon the work already set forth, and the manner in which they were chiefly engaged. A comparison of this table with that accompanying the report of 1888 will show that the force has been diminished by two engravers and one copyist, and increased by one apprentice engraver:

*The distribution of force.*

Engaged.	Assistant.	Draftmen.	Record clerk.	Engravers.	Apprentice engravers.	Printers.	Apprentice printer.	Laborers.
As chief of the division, in the revision of engraving and in compiling and computing and directing the computations of results from data in relation to terrestrial magnetism and geographical positions.....	1							
In receiving and charging information which may affect H. O. charts, and in preparing for engraving the current corrections on published charts.....		1						
In preparing the sounding sheets of the Atlantic, Indian, and Pacific Oceans, and in compiling a history of deep-sea soundings.....		1						
In preparing new charts for engraving, and in correcting such charts as require extensive correction.....		7						
As computer.....		1						
As record clerk.....			1					
In engraving new charts, and in engraving corrections and additions on charts on issue.....				13	4			
In printing charts for issue, in printing and stamping official letter-heads, in stamping official cards and envelopes, and in backing charts.....						3	1	
In scouring and cleaning condemned plates for re-engraving.....								3
As messenger.....								1
Total.....	1	10	1	13	4	3	1	4

## RECOMMENDATIONS CONCERNING FUTURE WORK.

It is recommended that the work on the west coast of South America be continued until the different series are completed to Valparaiso. Below this point it is deemed inadvisable to compile and construct new charts to replace those at present issued, owing to the imperfect condition of the surveys.

Although this office has been essentially a chart-making establishment since the law created it for that purpose in 1866, and has made considerable progress of late by following out the lines of administration recently laid down, it has as yet accomplished only a small part of its total work. At the present rate it will take twenty years to control this subject as it is done by other great maritime powers. With the means at the disposal of the office it is not possible to accomplish in the near future all the important work that remains to be done, nor greatly to accelerate the present rate of working. It is, therefore, necessary to formulate some guiding principle by which the work done and the money spent will go farthest toward providing for the present need and future progress. In general it may be said that the regions which are most desirable to chart in order to supply the demands of American merchantmen are most important also in supplying the needs of the Navy, for where there are great commercial interests there will be a large squadron. We have then to consider (1) what are the commercial centers which are and which will be in the future most important to American interests; (2) what are the great channels of communication; what modifications of these are foreseen, and what will be the results of these modifications.

A consideration of what has been done and what remains to be done in connection with these principles has led to the conclusion that the work can be most advantageously prosecuted on the coasts of China and Japan. A plan setting forth the proposed limits and arrangement of these charts has been submitted. The more minute details of arrangement and limits will be presented from time to time in the form of skeleton charts.

Respectfully submitted,

G. W. LITTLEHALES,  
*Chief of Division of Chart Construction.*

The HYDROGRAPHER.

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DIVISION OF CHART SUPPLY,  
July 1, 1889.

SIR: I have the honor to submit the following report for the fiscal year ending June 30, 1889:

On the 4th of October the division of issue was consolidated with the division of supply under the title of the Division of Chart Supply. Owing to the scarcity of room, however, it has been impossible to effect any concentration of force, and for convenience of reference the former division of supply has become the Hydrographic Office section and the division of issue the British Admiralty section of chart supply.

It is the duty of the Hydrographic Office section to keep on hand a supply of all Hydrographic Office and Coast Survey charts published, and to have them correct to date.

There are 504 plate and 295 photolithograph charts on hand, making a total of 799 hydrographic charts. The Coast Survey charts have been

ordered in quantities as required to meet the demand for United States vessels and branch hydrographic offices only. In future all Coast Survey charts for the current supply will be sent direct from the Coast Survey Office to the ships and branch offices, and in the case of an original outfit Coast Survey charts will be sent to this office and then forwarded to the vessel to be fitted out, with the Hydrographic Office and British Admiralty charts in their proper portfolios, as shown by the station catalogues. The foregoing arrangement was made with the Coast Survey Office during the last week of the fiscal year, and has not yet been thoroughly tested, but there seems to be every prospect of its working satisfactorily in a short time.

During the year two branch hydrographic offices, one at Norfolk, Va., and one at Portland, Oregon, have been fitted out; also the Public library at Boston, Mass. This caused the issue of miscellaneous charts for the present year to exceed that of last year by 858 copies. Hydrographic Office charts Nos. 941 and 980 have been changed and extensive additions made upon them, so as to meet more fully the wants of the fishermen who frequent the localities covered by these charts, Mr. C. C. Hutchinson, of Boston, agent of the Hydrographic Office, having ascertained the wants of the men who use them.

By reference to the following summary it will be seen that the work of the Hydrographic Office section has been increasing, and it has now reached a point where it is necessary to have an additional draughtsman in order to keep the work up to date. This is especially the case on account of that part of it which had to be abandoned for want of sufficient force, viz: The comparison of all Hydrographic Office charts with new foreign charts received in the office, and the correction to date of spare copies of all photolithographic charts. This work was well in hand at the middle of November last, from which time one of the draughtsmen was absent until the middle of February and the other was sick two weeks. The force being thus reduced the work necessarily fell behind and has not been brought up with the force at present employed. By reference to the summary it will be seen that 29,329 copies of charts were issued from this section during the year. For the preceding year there were 5,202 copies less, and for 1887 and 1886 there were, respectively, 7,996 and 7,343 less.

The number of copies of charts sold to agents this fiscal year is greater by 981 copies than for the preceding year.

In addition to the regular outfits, all United States vessels and branch hydrographic offices have been supplied with copies of new and corrected charts. I call attention to the demand which has been made for the republication of the photolithographic chart No. 912. This chart is one which the whaling fleet to the Arctic would like much to have, and when a copy of it can be had it is regarded as a prize by the fortunate master. The supply of the following photolithographic charts, Nos. 7, 26*b*, 26*d*, 256, 272, 274, 277, 325, 376, 802, and 803, is almost exhausted, and I would recommend that plate charts be issued in their places as soon as practicable. The following summary shows the number of charts published, issued, and canceled, and compares some of the expenditures of charts for the fiscal years ending June 30, 1886, 1887, 1888, 1889:

## Statement of charts for fiscal year ending June 30, 1889.

	Third quarter, 1888.		Fourth quarter, 1888.		First quarter, 1889.		Second quarter, 1889.		Total.
	H. O. C.	C. S. C.	H. O. C.	C. S. C.	H. O. C.	C. S. C.	H. O. C.	C. S. C.	
<b>Copies of charts received:</b>									
From printing-room	4,951		3,463		5,870		6,060		20,344
From Coast Survey		1,128		1,878		1,947		1,605	6,558
<b>Total</b>	<b>4,951</b>	<b>1,128</b>	<b>3,463</b>	<b>1,878</b>	<b>5,870</b>	<b>1,947</b>	<b>6,060</b>	<b>1,605</b>	<b>26,902</b>
<b>Copies of charts issued:</b>									
To naval vessels	1,316	744	2,905	1,387	398	298	1,692	1,326	10,066
To archives	56	20	49	45	75	25	86	29	385
To agents	1,850		1,944		2,965		2,256		9,015
To merchant vessels	53		62		43		38		196
To merchant vessels (meteorological charts)	75		26		12				113
To foreign hydrographers	56		84		56		56		253
To home correspondents	234		82		176		215		707
To miscellaneous	559	629	795	553	2,658	1,285	1,781	335	8,595
<b>Total</b>	<b>4,199</b>	<b>1,393</b>	<b>5,947</b>	<b>1,985</b>	<b>6,383</b>	<b>1,608</b>	<b>6,124</b>	<b>1,690</b>	<b>29,329</b>
Charts published	9		19		21		21		70
Copies of charts condemned	77	55	47	120	97	114	96	64	670
Copies of charts canceled	5					4			9
Plans canceled	2		2			1	6		11
Copies of canceled charts condemned	281					244			525

## Comparison of charts received and issued during years 1886 to 1889, inclusive.

	1886.	1887.	1888.	1889.
Charts received from printing-room	16,931	15,183	17,510	20,344
Charts issued to naval vessels	5,488	7,570	6,233	10,066
Charts issued to agents	7,233	7,202	8,034	9,015
Charts issued, miscellaneous	3,078	4,096	7,737	8,595
<b>Total issued by H. O. section</b>	<b>21,986</b>	<b>21,833</b>	<b>24,127</b>	<b>29,329</b>

The following details of the work of the British Admiralty section are supplied by Ensign W. B. Whittelsey, in charge.

During the year the following-named vessels have been furnished with a full allowance of charts, as per standard catalogue of stations, viz: *Boston*, *Constellation*, and *Kearsarge*, fitted out for the North Atlantic station; *Adams*, *Atlanta*, *Iroquois*, *Mohican*, and *Monongahela*, fitted out for the Pacific station; *Dolphin* and *Swatara*, fitted out for the Asiatic station; and the *Richmond*, fitted out for the South Atlantic station.

Partial outfits have also been furnished to the following vessels for cruising in other waters than those for which fitted out or for short trips along this coast: *Atlanta*, *Constellation*, *Despatch*, *Enterprise*, *Fortune*, *Gedney*, *Jamestown*, *Juniata*, *Kearsarge*, *Richmond*, *St. Mary's*, and *Yorktown*.

The branch office at San Francisco, Cal., was furnished with all the British Admiralty charts of the Pacific coast of America and of Australia.

The following vessels returned old outfits of charts: *Atlanta*, *Despatch*, *Dolphin*, *Brooklyn*, *Jamestown*, *Juniata*, *Iroquois*, *Lancaster*, *Mohican*, *Pensacola*, *Portsmouth*, *Richmond*, and *Swatara*.

The work of comparing British Admiralty charts of other than Brit-

ish coasts with the charts published by the country governing that coast has been nearly completed, but on account of the removal of one of the draughtsmen it will be delayed and can only be taken up at intervals.

The return of so many old outfits from vessels going out of commission or transferred to other stations materially increased the work of this section, and great credit is due the draughtsmen that the end of the year finds all routine work up to date.

The following summary shows the number of charts received, issued and condemned during the year:

**Received:**

From J. D. Potter, agent for admiralty charts, London, England.....	3,18
From the British Admiralty (complimentary).....	22
From United States vessels.....	2,29
From divisions and branch offices.....	8
From B. F. Stevens, United States dispatch agent, London, England....	1,56
From division of supply (Hydrographic Office and Coast Survey charts).....	9,94
<b>Total.....</b>	<b>17,27</b>

**Issued:**

To United States vessels, from this office (British Admiralty).....	3,40
To United States vessels, from this office (Hydrographic Office).....	6,28
To United States vessels, from this office (Coast Survey).....	3,79
To United States vessels, through B. A. Stevens, London, England.....	1,56
To branch hydrographic offices.....	27
To archives.....	19
To divisions of supply and chart construction.....	4
To miscellaneous.....	3
<b>Total.....</b>	<b>15,46</b>

Condemned.....	1,38
Number of British Admiralty charts on hand.....	10,93

The Notices to Mariners published during the year affected 1,501 standard admiralty charts and required hand corrections on 2,751 copies. There were 2,629 admiralty charts corrected by hand from British Admiralty data and no date alterations.

Total number of charts corrected by hand was 6,839.

There have been 30 new British Admiralty charts put on issue.

Respectfully submitted.

D. W. COFFMAN,  
*Lieutenant, U. S. Navy, in Charge.*

The HYDROGRAPHER.

**DIVISION OF SAILING DIRECTIONS,**  
*July 1, 1889.*

SIR: I have the honor to submit the report of this division for the fiscal year ending June 30, 1889.

**BOOKS.**

On October 15 the books were removed to the room adjoining that occupied by the Notices to Mariners and Archives, thus bringing all three portion of this divisions together, and thereby greatly facilitating the work of the whole. Later on, all the sailing directions were removed from the store-room adjoining the meteorological division, leaving the space for forms and instruments, where all surveying books and

forms were sent. The reference shelves were re-arranged and the cards carefully overhauled.

During the year the following-named vessels were furnished with complete outfits: *Adams, Atlanta, Boston, Constellation, Dolphin, Iroquois, Kearsarge, Mohican, Monongahela, Richmond, and Swatara*. The outfit of the *Constellation* went afterward to the *Jamestown*.

Partial outfits for special service were sent to the following vessels: *Chicago, Despatch, Kearsarge, Constellation, Juniata, Terror, and Yorktown*.

Two new branch offices were supplied with all books and forms required.

Complete sets of Hydrographic Office publications were sent to the public library at Boston, Mass., and to the Paris Exposition. Nearly 3,000 books and pamphlets, relating to navigation, were turned over to the Bureau and shipped to the navy-yard, in pursuance with the plan of keeping only such works as relate strictly to hydrography. Seven thousand four hundred and seventy Hydrographic Office publications, including supplements and pamphlets, were forwarded to the branch offices for distribution to observers. This was in addition to the regular outfit of those offices, and consisted of editions published from ten to twenty years ago, which were largely in excess, and for which there was little or no sale.

The policy pursued with the recent publications of this Office is to limit the editions to 300 or 400. This prevents an accumulation of old material, is more economical, and, before they are exhausted, changes have occurred which necessitate the preparation of new editions, while a wholesale condemnation of old copies is avoided, or time and the cost of labor saved in their correction.

The following publications were placed on issue during the year:

H. O. No. 86. The Caribbean Sea and Gulf of Mexico, Vol. I, including the Bahamas and the Bermuda Islands.

H. O. No. 30. The List of Lights of the World, Vol. I, east and west coasts of North and South America, including the West India and Pacific Islands.

H. O. No. 31. The List of Lights of the World, Vol. II, south and east coasts of Asia and Africa and the East Indies, including Australia, Tasmania, and New Zealand.

H. O. No. 32. The List of Lights of the World, Vol. III, west coast of Africa and the Mediterranean Sea, including the Adriatic, the Black Sea, and the Sea of Azov.

The remaining volumes of the series, Nos. 4, 5, and 6, were not printed, as the appropriation was exhausted.

Hydrographer's report for 1888:

Nautical Monograph No. 5. The great storm off the Atlantic coast of the United States, March 11-14, by Ensign Everett Hayden, U. S. Navy;

Rules and regulations relating to the anchorage of vessels in the port of New York;

American Practical Navigator, edition of 1888;

Beacons, buoys, stakes (Light-House Board), 1st to 13th districts;

Tide Tables, Atlantic Coast United States, 1889 (Coast Survey);

Nautical Almanacs, 1889, 1890, 1891; Whirlwinds, Cyclones, and Tornadoes, Davis.

The following British Admiralty publications were purchased and issued to the service:

Hydrographic Notices of 1888: No. 5, relating to the Danish Pilot; No. 6, to St. Lawrence Pilot, Part I; No. 8, to Ireland, Part I; No. 9, to Bristol Channel; No. 10, to England, West Coast; No. 11, to Nova Scotia and Bay of Fundy, and No. 12, to Pacific Islands, Part III. Hydrographic Notices of 1889: No. 2, relating to North Sea Pilot, Part IV, and No. 4, to Scotland, West Coast. List of Time Signals, 1888 (Admiralty); British Columbia Pilot; Baltic Pilot; Norway Pilot (2d edition); Revised Supplement to Red Sea Pilot; Tide Tables of British and Irish ports, and of the world; Supplement to China Sea Directory, Part III; Supplement to China Sea Directory, Part IV; Elementary Meteorology, Scott; Ocean Meteorology, Martin; Weather, Aberromby.



Most of these publications are pamphlets, mainly hydrographic notices, relating to sailing directions on issue to ships of war. In ordering these British Admiralty publications, only enough copies were required to supply the ships in service, the issue shelves of this division (where five copies are kept corrected), and such of the branch offices as would have occasion to refer to them in reply to inquiries for information. In course of time it is hoped that we will be able to rely entirely upon our own publications.

The issuing lists have been overhauled and corrected, and new forms prepared, the object being to reduce as much as possible the number of books of reference, while furnishing all that are required for the guidance of the navigator. To the general list of nautical books the new works on meteorology mentioned in the foregoing lists have been added, supplanting those formerly issued by the Bureau and furnishing the ships' libraries with the latest and best information on the subject of storms and all that pertains to the study of ocean meteorology.

The following publications have been completed during the year:

No. 87. The International Code of Signals.

No. 88. The East Coast of South America, from Cape Orange to Cape Virginia, including the outlying islands.

No. 89. The West Coast of South America, comprising Magellan Straits, Terra del Fuego, and the outlying islands.

The International Signal Code was revised and corrected to date, and several new sections were added to Part III of especial use on the coasts of the United States, including distress, danger, and additional signals, the United States Signal Service, the Life Saving Service, the list of time balls in the United States, lists of additional semaphore stations, also a complete list of all foreign storm-signals to date, published from time to time in the Notices to Mariners of the Office. References will be made regularly to the code hereafter in the notices, so that the book may be kept corrected to date.

Frequent demands have been made for this book, as the last American edition (1884) has been exhausted for some time. The manuscript was sent to the Government Printing Office last November, and the proof has just been read and compared with the recently issued editions of the English and French codes.

In pursuance of the policy of this Office to increase its resources in the shape of sailing directions, the aim has been to be completely independent of foreign sources, and, in time, to eventually supplant others by our own publications. This is as it should be, and the Government should be able to rely wholly upon its own departments for sources of information in this direction; in time of war, the importance of possessing complete sets of charts and sailing directions for the safe conduct of its vessels is manifest. This is the case with England and France; Germany is rapidly following, and the United States should not be left behind.

This subject is one that demands serious consideration, and it is earnestly hoped that greatly increased facilities will be extended to this Office in order that this result may be attained.

The plan has been to complete, first those works embracing the Western hemisphere, and, afterwards, proceeding east and west, to take the rest of the world. According to this arrangement, the manuscripts of Nos. 88 and 89, the East and West Coasts of South America, respectively, were thoroughly overhauled and revised and prepared for the printer, but owing to the lack of funds they met with the same fate as did the International Signal Code. These books will take the places

the Admiralty publications, South America Pilot, Part I, East Coast, and South America Pilot, Part II, West Coast. No. 90 is the "Recent Developments in Great Circle Sailing," by Mr. G. W. Littlehales, and is now in press. The manuscript of No. 92, the "Gulf and River of St. Lawrence, Nova Scotia, and the Bay of Fundy," has nearly reached completion, and in a short time will be ready for the printer. This will supplant the British Admiralty publications, "St. Lawrence Pilot," Vols. I and II, and the "Southeast Coast of Nova Scotia and the Bay of Fundy." This book was originally commenced at the branch hydrographic office at Boston, but has been overhauled, revised, and completed in this division.

The foregoing, with the "Vancouver Island and British Columbia Pilot" (No. 93) will complete the entire Western hemisphere. This manuscript was sent in from the branch office at Philadelphia and will be the next revised. The work of printing these books should be gone ahead with as soon as possible. The "Coasts of Denmark and Holland" was received from the branch office at New Orleans, and the "Sailing Directions for the North Sea," published by the German Hydrographic Office, was translated for this division. Both of these manuscripts have to be overhauled, compared with the charts, and revised before publication.

When these manuscripts are received from the branch offices the work must be entirely gone over and verified, and all additional information that can be obtained from the archives of this office, the intelligence office, statistical data, consular reports, etc., must be incorporated. This necessarily involves time and labor, and here arises the difficulty of not having a sufficient force of assistants to carry on the work, which goes on accumulating. There are several manuscripts on hand awaiting revision, some of which were prepared three or four years ago, but which could not be finished because of the lack of assistance. These, of course, must be entirely revised.

Several very valuable papers, relating to various parts of the world, have been translated, for this division, from the *Annalen der Hydrographie und Maritimen Meteorologie*, of the German hydrographic office, which have been and will be incorporated in the new sailing directions.

The list of reported dangers in the North and South Pacific Oceans, prepared in 1871 and 1879, respectively, will be taken up again as soon as possible. This work of revision has been partly done, but so many contradictory reports have been received, and such conflicting evidence exists, that the work has been proceeded with slowly. In the original reports the chief trouble lay with the disagreement of the Dutch charts with those of other nations, but latterly they have adopted the same longitude as the British Admiralty. Duplications and discrepancies doubtless arose in the positions of these dangers, depending upon the authority used.

One of the subjects to be considered by the coming International Marine Conference is that of searching for doubtful dangers with a view of removing them from the charts. These doubtful dangers have always been a bugbear to navigators in the Pacific, and now, since the telegraphic determinations of longitude in the East Indies, China, and Japan, in 1881 and 1882, discrepancies in the positions of actually existing dangers should not occur. In the new edition both volumes will be combined into one, and all such dangers as really exist, whose position is charted, or those known positively not to exist, will be omitted from the list in the new publication.

If a plan could be agreed upon whereby the Pacific could be apportioned into districts among the various naval powers represented at the conference, and a thorough survey of such allotted portions be made by each, this question could be definitely settled, a source of doubt removed, and a feeling of security obtained in the navigation of these waters. Another feature to be discussed is a uniform method of collecting and disseminating information.

In this connection, the usefulness of the consular service becomes apparent. The reports forwarded through the State Department at this office, by consuls in the sea-port cities, relating to the water over bars and in channels, are very valuable. Information concerning the approaches to their cities, harbor improvements, bridges, pilots, dues, increased trade, and commercial facilities—improvements, in fact—are a great help in the compilation of directions and in the construction of charts. Changes and improvements are continually being made, and while this office issues publications that are to be of use to the Navy and mercantile no one can supply such information better than those who are so located to obtain it, and who must be deeply interested in the commercial advancement of the country they represent.

In the preparation of sailing directions, the office designed to these publications thoroughly practical in their character by the inclusion of all matter of no value for purposes of navigation, or ephemeral in its nature as to be useless a short time after being issued. The chart being the principal guide, all matter which could be shown upon it was considered unnecessary duplication in the directions. In accordance with this idea, all lights, beacons, plainly delineated on the chart, all historical matter and descriptions were omitted.

The resulting publications were concise, convenient to be serviceably gotten up, and much loss of time was saved through a lot of miscellaneous information. The system received approval from the regular service, but it was thought that the work of revision was too radical in omitting much that was of service to the merchant marine, for which these books are intended. Ships-of-war are provided with every facility in the way of navigation, but the merchant service is not so well equipped, therefore, very careful discrimination had to be exercised in the books should be of practical value to both services. The offices were ordered, by your direction, to consult with the masters, owners of steam-ship lines, our agents, and others connected with the mercantile marine, and learn their views as to what was necessary to make the books of practical use to them, and in every instance were commendatory, and no additional changes were made. Letters were also addressed to officers of well-known extensive experience with this subject, requesting their suggestions for solution of the problem, and the method pursued met with approval, while some very valuable hints for future work were given. In No. 84, the west coast of Mexico and Central America, prepared under the new system, the elision was thought of, but No. 85 (Indian Ocean) and No. 86 (Caribbean Sea, Mexico, Vol. I) were highly spoken of. The former supplanting and cumbersome Indian Ocean Directory, Findlay, and "Directions for the Mauritius," the latter a British Admiralty publication of the same locality.

Some important suggestions were received from the

Meade, U. S. Navy, and Lieut. Commander Z. L. Tanner, U. S. Navy, which will be included in forthcoming publications. Owing to the confusion incident upon the breaking out and overhauling of the store-rooms, the re-arrangements of the reference cards, and of the supply and issue shelves, and the disposing of the superfluous books of old editions, and owing to our being so short-handed that the current work of the division occupied all the time of the force, this idea was set aside for a time, but it is the intention to obtain the views of as many experienced officers as possible, that the office may proceed in the work of editing sailing directions, in the best manner, until the entire set is complete. Some new features have been added to the east and west coasts of South America (No. 88 and No. 89) on the views above suggested, including lists of lights within the limits of each, coaling and docking facilities, etc., in a tabulated form in the appendix; while much additional information, of an exceedingly useful character, appears in the body of the text.

The editions of No. 58, the "Navigation of the Pacific Ocean and China Seas," 1875, and No. 20, "Directory for Behring Sea and the coast of Alaska," have been exhausted. The former, although published fourteen years ago, is still much sought after, and the officer in charge of the branch hydrographic office at San Francisco states that the agents inform him that this work sells very well. Frequent applications have been made for it to this office, and I think it would be well to republish it. Books of this character, which contain general information relative to the best sailing and steam routes; observations upon the calms, winds, typhoons, etc., change but little, and are always sought after. To attempt to embody all this information in the sailing directions would make the latter cumbersome, and it had better be published separately. The series of books of this character (general examinations, and navigation of the Atlantic, Pacific, and Indian Oceans) are among the most useful published by the office.

The pamphlet on the use of oil is exhausted, and a new one should be gotten out as soon as possible, embracing all the additional information on the subject relative to its efficacy in lessening the dangerous effects of heavy seas. England, France, Germany, and Spain have all published pamphlets on the beneficial results obtained from its use, and the idea, which was first suggested by this office, has now become a recognized fact by maritime nations all over the world.

Several additions have been made to our list of foreign exchanges, principally of foreign geographical societies, and the time of an assistant could be well employed alone in translating from and noting the valuable information contained.

In the work of this section of the division I have been well aided by the two assistants detailed for this duty, Mr. Robert C. Ray and Mr. R. H. Orr, who have most capably performed the tasks assigned them. Mr. Ray has revised and prepared the manuscript of the west coast of South America, and has well advanced on the "Dangers in the Pacific." Mr. Orr prepared the east coast of South America, and has the manuscript of the Gulf and River of St. Lawrence, Nova Scotia, etc., well in hand. In addition, both these gentlemen were obliged to devote much time to the current work of the division, owing to the resignation of the assistant detailed to perform that duty.

#### NOTICES TO MARINERS.

The work of preparing the weekly notices to mariners, and the separate extracts, has been very successfully continued by Mr. Boynton

Leach, assistant, who has been untiring in his efforts to improve the notices and the light-lists in ever way.

The plan of grouping together the paragraphs that relate to the same general locality continues to grow in favor with the maritime community, and no better evidence of this fact could be produced than the comparative table which follows. In fact, these figures are even greater, as the report shows the sum total for the *whole year*, but during the last six months the number of extracts distributed reached a total 513,000, or at the rate of 1,036,000 annually.

This large amount of information distributed over the world is significant, from the fact that it furnishes an indication of the direction toward which commerce is tending, in the constantly increasing demands of certain districts, together with its value from other points of view.

Of course, a great deal of the success of this service is due to the branch hydrographic offices, and the value of these important adjuncts becomes every year more apparent, and commends itself to the intelligent consideration of the maritime community. From their location, they are brought into contact with the maritime exchanges, owners of steam-ship lines, ship-masters, and the sea-faring world generally, and their opportunities for collecting and disseminating information are unexceptionable.

During the year, at a meeting of the officers in charge of the branch offices, a new arrangement for the distribution of the extracts of the Notices to Mariners was agreed upon, and the following is the method now pursued:

The earth's surface is divided into the following districts, and the extracts relating to each are printed on separate sheets:

1. All water on the east coast of North America, except the United States.
2. East coast of the United States, to and including Florida Reefs, and Bermuda and Bahama Islands.
3. The coast of the Gulf of Mexico, West India Islands, Central America, and the north coast of South America to the equator.
4. East coast of South America, from the equator south, including the Falkland and Georgia Islands.
5. All waters of the north and west coasts of Europe, to the Straits of Gibraltar, including the British Islands, Spitzbergen, and Iceland.
6. The Mediterranean, Black, and Red Seas.
7. The west coast of Africa and the adjacent islands.
8. East coast of Africa, Indian Ocean, Persian Gulf, and the south coast of Asia, to the Straits of Malacca.
9. The East India Islands, China, Japan, and the Russian Possessions.
10. Australia, Tasmania, and New Zealand.
11. The Pacific Islands.
12. Straits of Magellan, and the west coast of South America, to and including Panama.
13. America, west coast, from Panama north.

The necessity for better printing facilities is felt more than ever. This office should be able to issue its publications regularly on time, and their value consists in the promptitude with which the information they contain can be presented where it is most needed.

The services of a translator are required, for much information that comes into this department can not be used until, perhaps, it appears again translated by some other nation. While Mr. Leach, the assistant in charge of the notices, has been very successful with his translations, when evidence notices in most of the European languages, much time is necessarily taken up with them. The translator is needed not alone for the notices but the archives as well, and to make notes from the publications that are received from our foreign exchanges in the book division, which contain much valuable information that should be used in

the new editions of the sailing directions. And here the advantage of possessing better printing facilities would come in, for supplements compiled from these translations, from our own sources of information, from consular reports, etc., could be prepared and published regularly as corrections increased to require them, saving time and the cost of labor in the present method of correction of books, until after about five years (a fair average for the life of an edition) a new one became necessary and could be issued.

During the year 1,047 announcements of importance to navigation were published in the form of Notices to Mariners, an increase of 145 over the preceding year.

The usefulness of this publication has been enlarged by the addition of reference notes for convenience in correcting sailing directions, and other nautical publications, and the form has been improved by making the table of contents detachable.

The appreciation of these notices by the maritime community is best exemplified in the increased demand, as shown by the comparative figures for the past three years, arranged in the following tabulated form:

*Notice to mariners.*

Fiscal year ending June 30—	Number of announcements published.	Circulation.		
		Weekly issue.	Extracts.	Total.
1887.....	590	41,600	217,002	258,600
1888.....	904	41,600	431,700	473,300
1889.....	1,047	46,800	770,029	816,829

NOTE.—The circulation for the past six months is at the rate of more than 1,000,000 copies per annum.

The yearly index of notices was completed in ample time for its publication coincidently with the last weekly issue of the year 1888, but has not yet been published. The printing office in the Navy Department being unable to print it, the manuscript was sent to the Government Printing Office, where it has remained.

#### LIGHT LISTS.

The List of Lights of the World, comprised in six volumes, has been revised and kept corrected to date, ready for publication. Revised editions of three volumes, Nos. I, II, and III, have been published. Revised editions of the remaining volumes should be published as soon as practicable. I recommend that the present Vol. I be divided into two volumes, as follows: Vol. I to comprise the east coasts of North and South America, including the West Indies; Vol. II, the west coast of North and South America, including the Pacific islands. The number of the present Vol. II to be changed to VI. Also, for economical reasons, that the list of lights of the British Islands (at present Vol. VI) be no longer published, but purchased yearly from the British Admiralty and issued in the same form, to be numbered Vol. VII.

#### ARCHIVES.

The work of classifying, indexing, and arranging the documents, records of surveys, and all sorts of hydrographic information has continued without interruption, and every effort has been made to enhance the

convenience and certainty of reference. This duty has been very capably performed by the custodian, but has been necessarily hindered by the confined space devoted to the archives. The present system has heretofore answered very well, and is in accordance with the plan originated some three years ago. With the continually increasing scope of the Hydrographic Office and its branches, and the extension of its sources of information, another arrangement becomes necessary, and a board of reference was directed, by your order, to report upon the best method of indexing, classifying, and arranging information for the general use of the office. In accordance with their recommendations, all printed matter is to be indexed according to the plan now in operation in the book section of this division, and, for convenience of access and classification, all manuscript and other unbound information is to be indexed and cross-indexed under definitely established heads, in geographical sections, bounded by parallels of latitude and meridians of longitude. In the present system there are 14 sections; with the proposed plan there will be 24. In addition to the card index, an index book, on the Burr system, is recommended by the board, the indices to be revised from time to time and the result published in serial form.

During the year there have been received 1,200 documents, and about 700 charts have been catalogued and shelved.

During the last month of the year I have had the assistance of Mr. C. P. Bolles in the archives, and to him was assigned the care, arrangement, and cataloguing of the charts. This is a task that requires constant and intelligent attention. Upwards of 12,000 charts, the work of our own and foreign hydrographic offices, and of the United States Coast Survey, are to be so arranged that they can be readily accessible for reference, and the latest editions of each to be on the shelves. This involves frequent correspondence with foreign hydrographers and close scrutiny of all publications to see that none are omitted. By means of a date book, upon which Mr. Bolles has expended much time and attention, this information is instantly obtained.

Valuable hydrographic information has been received from the following vessels: *Essex*, Commander T. F. Jewell, U. S. Navy; Lieut. C. D. Galloway, navigator. *Boston*, Capt. F. M. Ramsay; Lieut. W. M. Fullam, intelligence officer. *Atlanta*, Capt. J. A. Howell; Lieut. N. E. Niles, navigator. *Galena*, Commander G. W. Sumner; Lieut. W. J. Barnette, navigator. *Kearsarge*, Commander A. D. Brown. *Tallapoosa*, Commander F. M. Dickins; Lieut. C. F. Norton, navigator. *Alliance*, Commander G. W. Pigman; Lieut. W. P. Day, navigator. *Sucatará*, Commander J. McGowan; Lieut. C. P. Perkins, navigator. *Nipsic*, Commander A. W. Mullan; Lieut. R. G. Davenport, navigator. *Enterprise*, Commander B. H. McCalla; Lieut. R. F. Fickbohm, navigator. *Lancaster*, Capt. T. F. Kane; Lieut. J. P. Merrill, fleet intelligence officer. *Quinnebaug*, Commander C. H. Davis; Lieut. O. O. Cornwell, navigator. *Trenton*, Capt. N. H. Farquhar; Lieut. R. M. G. Brown, navigator. *Mohican*, Commander B. F. Day; Lieut. F. M. Symonds, navigator. *Adams*, Commander R. P. Leary; Lieut. J. Parker, navigator. *Vandalia*, Capts. Schoonmaker and Howison; Lieut. J. C. Wilson, navigator. *Ranger*, Commander F. A. Cook, Lieut. C. F. Pond. *Pinta*, Lieut. Commander J. S. Newell; Ensign, D. S. Terrell. *Dolphin*, Commander, G. F. F. Wilde; Lieuts. T. C. McLean and W. A. Marshall, navigators. *Marion*, Commander N. M. Dyer; Lieut. C. F. Emmerich, navigator. *Palos*, Lieut. Commander J. E. Craig; Lieut. F. M. Bostwick, navigator. *Juniata*, Commander W. C. Wise; Lieut. N. H. Barnes, navigator. *Omaha*, Capt. F. V. McNair; Lieuts. J. M. Miller and J. B. Murdock,

navigators. *Blake*, Lieut. J. E. Pillsbury. *Albatross*, Lieut. Commander Z. L. Tanner.

A pamphlet by Lieut. M. A. Hautrenx, of the French navy, president of the Société de Géographie Commerciale de Bordeaux, on Collisions at Sea, and prepared with special reference to the coming International Marine Conference, was translated in this division by permission of the author. M. Hautrenx, in his very courteous letter, expressed his high appreciation of the service of the Hydrographic Office, and of its benefit to the maritime world, especially referring to the value of the Pilot Chart, and expressing a hope that England and France would join in a like enterprise.

For a series of examinations, conducted under civil-service rules, to fill vacancies in this and the branch offices, sets of questions were prepared in this division, embracing seamanship, navigation, nautical surveying, ocean meteorology, laws of storms, etc., and the applicants in every case were graduates of the Naval Academy who had completed the academic course of four years and a two years' cruise at sea. The benefit of this to the office is apparent, as the services of these gentlemen were at once available, and no time was lost in technical training.

#### INFORMATION.

Requests for information flowed in continuously, relating to almost every point concerning the subject of hydrography, and much time and attention was required to answer these inquiries, which embraced questions as to harbor improvements, dues, depths of channels, rivers, canals, etc.; the existence and location of dangers to navigation, boundary lines, climate and health statistics, surveys, explorations, etc., all over the world.

As all matter not relating strictly to hydrography has been transferred from this division, it became necessary to consult the libraries of the several Departments, and carry on an extensive correspondence with our consuls abroad, and communicate with foreign hydrographers, in order to supply the desired information. A great deal of the time of one assistant could be well taken up with this subject alone.

#### PERSONNEL.

The following changes have occurred in the personnel of this division during the year: Lieut. J. C. Fremont, transferred to Chart Construction October 8; Lieut. C. M. McCarteney, transferred to Sailing Directions October 8; Lieut. F. H. Sherman, reported June 14—at work on the Notices to Mariners; Mr. R. C. Ray, reported December 8, Book Division; Mr. C. C. Billings and Mr. W. J. Wilson resigned.

In conclusion, I have only to express the hope that, with additional assistance, and increased printing facilities, the service of this division will speedily reach that degree of efficiency to which it is your desire that it should attain.

Respectfully submitted.

CHAS. M. MCCARTENEY,  
*Lieutenant, U. S. Navy, in charge.*

The HYDROGRAPHER.



## DIVISION OF MARINE METEOROLOGY,

July 1, 1889.

SIR: The routine work of this division has been carried on with increased efficiency during the past year, thanks to the support that you have yourself given to our efforts, the zeal and efficiency of my assistants, and the constantly-increasing interest and support of our voluntary observers aboard various vessels of the mercantile marine.

In addition to observations received regularly from United States naval vessels, Greenwich noon observations are now received from 1,031 others, and this number is increasing rapidly. Besides the synchronous observations taken at noon (Greenwich meridian time) aboard vessels in every ocean, 116 meteorologic journals have been returned, filled, during the past year, and 71 new ones have been issued. As stated in my last annual report, the number of journals already on hand, and the difficulty and expense involved in utilizing the data contained therein, have induced us to devote more attention to the issue of Form 105 (Greenwich noon observations). As soon as utilized in this office, these forms are forwarded to the Chief Signal Officer, U. S. Army, and the information contained therein (added to similar data received from various other sources, principally through international co-operation), utilized in the construction of daily synoptic charts of the entire northern hemisphere, from which the most valuable and practically important results are deduced and published. In return, meteorologic data from land stations are supplied to this office by the Signal Office whenever needed in the discussion of an ocean storm. Such independent collection and mutual use of land and ocean data have naturally resulted in increased efficiency and economy, and there can be little doubt but that double the amount of marine data would have been available for the discussion of the international simultaneous meteorologic observations had the present system been in operation during the entire period of observation.

At the present rate of increase in the number of observers, the time may soon come when the data will be sufficiently complete to allow of the preparation of daily charts of the southern hemisphere, from which similar valuable results may be derived.

I may well mention here an additional important use of Form 105. A cablegram is prepared every night at the office of the Chief Signal Officer, U. S. Army, and sent to Professor Mascart, director of the Central Meteorologic Bureau of France; in it is given an outline of the weather over a broad belt of land and water, including a large part of the United States, Canada, and the Atlantic as far east as the forty-fifth meridian, together with any late reports of wrecks, ice, or other dangers to navigation. Marine data not older than seven days are used in preparing this cablegram, and it is only fair to say that the Chief Signal Office has himself strongly complimented the officers in charge of the branch hydrographic offices upon their promptness in forwarding data, all of which are extracted from Form 105 immediately upon receipt. Although this is a matter that adds greatly to the work of several of the branch offices, involving the scrutiny of many hundreds of forms and the copying upon another blank of such observations as are late enough to be of use in this connection, yet the fact that the results may thus be made immediately useful to vessels about to sail for America from European ports can not fail to lighten the task of all who contribute in any way toward the success of Professor Mascart's undertaking.

The Pilot Chart of the North Atlantic Ocean has been issued regularly each month, and efforts have been made still further to increase its usefulness to navigators. Probably no strictly nautical publications

has ever had a greater success than this, and the marked interest and favor with which navigators of every nationality regard the work of this office is to a large extent due to the essentially practical character and wide circulation of the Pilot Chart. Articles that appear in this publication are widely quoted and republished in nautical newspapers and journals, at home and abroad, and certain newspapers (notably the New York Herald and Boston Post), print a small abstract chart in their columns, based upon the Pilot Chart itself. The London Shipping World and Herald of Commerce, also, has started a small chart and issues it regularly each month, stating editorially that it has imitated the good example set by this office. In order to assist newspapers in thus circulating information of importance to shipping interests, and at the same time economize the edition of the chart itself, advance sheets of all printed matter published on each chart are sent out a day or two before it is issued, together with a small "abstract" chart, giving, in black and white, the most important features of the Pilot Chart; in this way newspapers are enabled to print extracts from the Chart on the very date of issue, and an immediate and wide circulation is thus secured for each item published.

The large amount and diverse character of information published on the Pilot Chart forbid any extended reference here, and I need only refer to supplements that were issued in August and February, devoted especially to the subject of derelicts and wreckage. The August supplement was devoted principally to the history of the logs from the great log-raft abandoned off Nantucket in December. The drift of the logs was both indicated graphically and discussed in the accompanying text, and every report received in time to be used, 147 in number, was published. The February supplement was prepared at very brief notice, upon receipt of a telegram saying that the famous derelict schooner *W. L. White* had reached the Hebrides, and gave a complete account of the remarkable cruise of this dangerous obstruction to navigation. Without attempting to refer to her history at any length, it will suffice to say here that this derelict vessel, abandoned off the capes of the Delaware during the March "blizzard," crossed the Atlantic in ten months and ten days, moving along an erratic track that measured more than 5,000 miles; she was reported forty-five times, and for six months remained off the Grand Banks, directly in the track of transatlantic steamers, three of which sighted her in a single day. There could be no stronger arguments than such definite and irrefutable facts to enforce the importance of clearing the seas of such obstructions, and probably nothing that has ever been published on this subject has attracted half the attention that these two publications have received.

Of all the subjects that have been referred to on the Pilot Chart during the past year, the most important, in my opinion, is the extension of our telegraphic weather service to include the shores and islands of the Caribbean Sea and Gulf of Mexico. This subject has been discussed at considerable length in the Chart for the past three months. A small telegraph chart has been published to illustrate the admirable facilities that are already available for use in getting regular telegraphic reports, and a hurricane chart to illustrate the tracks followed by the principal hurricanes on record. At the same time, a large amount of important practical information has been given for use aboard ship during the present hurricane season. The fact that telegraphic warnings of the approach of these terrific storms toward our coasts might be easily obtained and sent out to navigators is by no means new; it has been recognized for years, and efforts have been made from time to time, and

with greater or less success, to take advantage of it. But it may fairly be said that no well-directed and thoroughly successful effort has, as yet, been made either to collect reliable and complete data or thoroughly to take advantage of and circulate information that has actually been received.

Through your kind permission, and by authority of the honorable Secretary of the Navy, I was enabled to visit Havana for a month during the last hurricane season. Upon presenting my letters to our consul-general, Mr. Ramon O. Williams, and to Rdo. Padre Viñes, S. J. the eminent director of the meteorologic observatory of Belen College, was received with the greatest cordiality, and enjoyed exceptional opportunities to study West Indian hurricanes. Among other friends to whom I was indebted for many kindnesses and great assistance, I would specially mention Capt. Luis Garcia y Carbonell, of the Royal Spanish navy. This officer has now been placed in charge of the newly organized meteorologic service, with stations at various points in Cuba, Puerto Rico, and others of the West Indies and Windward Islands; as telegraphic weather reports are now exchanged regularly between Washington and Havana, the system having gone into effect June 1. Thanks to your efforts in this matter, and to the co-operation of General Greely (Chief Signal Officer, U. S. Army), Captain Carbonell, and various telegraph companies, ample notice will probably be received of any hurricane that may originate this summer to the southward and eastward of us. The extension and perfection of the system thus inaugurated can not but be regarded as by far the most important practical advance that can be made by our Weather Bureau, both as regards predictions of weather over the United States east of the Rocky Mountains, and more especially as regards the safety and success of commerce.

In this connection I would refer also to the character of our signals, as displayed at coast stations of the Signal Service. As you are well aware, earnest efforts have been made by this Office the past two years to assist the Signal Office in causing to be understood among navigators the exact character and meaning of the present system of cautionary and storm-signal flags. Colored and descriptive text have been published, both in Notices to Mariners and on the Pilot Chart, and widely circulated. Nevertheless, I have to say that I do not regard the system now in use as adapted to the purpose, and I would strongly recommend that adequate steps be taken to revise it in accordance with the needs of the service and the experience and usage of the principal maritime nations of the world. This is a subject that this office would naturally be most vitally interested in, both on account of its intimate relations to the Navy itself and the mercantile marine and the special training and experience of its officers.

While upon this subject, I am reminded to add a few words regarding the need in our naval service of a more thorough and more systematic of instruction in marine meteorology. My own experience at the Naval Academy and subsequent service at sea and in this office leads me to believe that it is very important for naval officers to familiarize themselves with every increase in our knowledge of ocean storms and the general principles of meteorology. Within the last few years this science has made rapid progress, and an opportunity should be given to every officer likely to be responsible for the lives and property aboard our ships to post himself by special practical study and training regarding the leading principles of weather changes and weather prediction.

ocean storms differ in certain marked ways from those on land, yet it is only a difference of degree. No school of instruction is so good as a modern weather bureau, where telegraphic reports are received and predictions made up and published. Moreover, at such a bureau, in addition to such wonderfully effective practical instruction, a complete modern meteorologic library is necessarily at hand; every detail regarding instrumental work, records, etc., is thoroughly understood and practically carried out, day by day, and a staff of trained officers and assistants are engaged in and familiar with the details of work relating to the various branches of the science. I have, therefore, the honor strongly to recommend that arrangements be made, if possible, for the regular detail of a certain number of naval officers to duty at the U. S. Signal Office, and to visit some of the principal meteorologic offices and marine observatories abroad. An officer could undoubtedly gain more real practical knowledge of tropical cyclones, for instance, by passing a month at the observatory at Havana, Mauritius, or Manila, during the hurricane season, than by studying the subject for a year without such opportunity for practical experience under the guidance of an expert. The recent naval disaster at Samoa has emphasized to a marked degree the dangers that the very best vessels are subject to, and has lent redoubled force to the following quotation from an article by W. Clement Ley on the squall that sunk the British training-ship *Eurydice* in March, 1878:

"At present I know of but one practical lesson to be learned from the disaster of March 24, which is this: Let meteorology, and, not least of all, the principles of cloud observation, occupy a very large place in the education of seamen."

In addition to the Pilot Chart, which, of necessity, occupies a large portion of the time of the division, the weekly supplement has been issued regularly, giving a late and reliable summary of important news regarding obstructions to navigation along the coast and the trans-atlantic route, changes in lights and bouys, etc. A special feature of this publication is to give a complete résumé of all reports of ice off the Grand Banks, a source of great danger to navigation.

A report upon the great storm off the Atlantic coast of the United States, March 11-14, 1888, known as the New York "blizzard," prepared at the close of the preceding fiscal year, was published as the fifth of the series of Nautical Monographs, and the edition was received from the Government Printer in January. Only 3,005 copies of this monograph were published, and, although great care has been exercised in its distribution, the principal object being to furnish our voluntary observers with some slight return for their services, the demand has been so great for copies that I would respectfully recommend that a new edition be ordered. The importance of thus publishing the results of our work, giving some immediate, though slight, return for the services of our voluntary observers and at the same time adding to the general fund of knowledge regarding ocean storms, leads me to hope that additional facilities will be provided during the coming year for the prompt publication of similar reports on other storms, regarding very many of which this office has already a vast amount of unpublished data. In the North Atlantic especially, we receive an enormous amount of data, more, indeed, than we can handle satisfactorily with our present force. It would be very advantageous if a preliminary discussion could be published within, say, three months after every notable storm, with a view to the subsequent publication of a more extended treatise, of permanent value to the scientific meteorologist as well as the practical navigator.

At the request of the Seawanhaka Corinthian Yacht Club of New

York, and under orders from the Navy Department, I delivered a lecture before the club at New York, February 9. My lecture was entitled "West Indian Hurricanes and the March Blizzard, 1888," and I repeated the same lecture before the Naval Institute at Annapolis, March 21. A full abstract was published in the *American Meteorological Journal* and republished, with additional text and plates, by the club. I may refer, also, in this connection, to a paper I prepared for the *United Service Magazine* (June, 1889), entitled "Tropical Cyclones." In this I gave some of the leading results of my studies at Havana, and again pointed out the importance to our commerce and seaboard States of a better weather service for the Bay of North America (the great arm of the North Atlantic, west of the 50th meridian, from Newfoundland to Venezuela, including the Caribbean Sea and Gulf of Mexico).

The preparation of a new edition of the pamphlet of blank forms, entitled "Reports of Marine Meteorology" (Form 105) allowed of the addition of several pages that render these blanks of still greater use to our observers and to this office. It is very important that the columns and symbols used in the Navy logs, as well as in our meteorological journals, should harmonize with those used in these forms, and I would strongly urge that this subject be thoroughly considered when a new edition of the logs and journals is to be issued.

Earnest efforts have been made to collect all possible data regarding the recent Samoan hurricane, as well as storms in general in that ocean, and as soon as circumstances shall allow of it, I hope that these data will be discussed and published. There is an urgent demand for a Pilot Chart of the North and South Pacific, and the South Atlantic, and the great success that has been achieved in the North Atlantic would seem to indicate that similar publications might well be established for the other oceans also. Such an undertaking, however, is, of course, out of the question with our present force and resources; but it is to be hoped that means will be provided during the coming year. Pilot Charts of the North and South Pacific should be published by the Branch Hydrographic Office at San Francisco, as in this matter the Pacific Slope section most immediately interested.

Relative to the personnel of the division, I wish to express my hearty appreciation of the zeal and intelligence with which every detail of the work has been carried on, in spite of almost insuperable difficulties both on account of its quantity and character. Mr. T. S. O'Leary's long absence on leave has left a place that is hard to fill, and I hope he may be induced to return and resume the work that he discharged with so much marked fidelity and success. Mr. R. L. Lerch has assumed, temporarily, many of Mr. O'Leary's duties, having taken charge of the *Weekly Supplement*, assisting also in the preparation of the Pilot Chart, and rendering valuable services in the way of translation of foreign meteorologic reports. Mr. A. H. Dutton has continued to handle a vast amount of correspondence, as well as personally plotting data on the daily synoptic charts of the North Atlantic and assisting in numerous other details of office work. Mr. C. G. Northrup, employed primarily as stenographer and type-writer, has become so useful in other and more important ways, keeping the records of journals and forms issued and received, that I would strongly recommend the employment of another skilled stenographer and type-writer, the work of the division absolutely requiring this addition to the force. During the past month the division has received a notable addition to its force through the

detail of Lieut. H. M. Witzel, U. S. Navy, who assumed charge May 19. I speak both for myself and for the other members of the division when I say that the detail of this officer has been received with the greatest satisfaction and must lead to the happiest results. The additional and very much needed room that has been given us will also greatly facilitate work, although both the force and quarters are still far too limited.

I may say in closing that several important improvements have been made on the July Pilot Chart, prepared during the past month; among others, its enlargement from  $4^{\circ}$  east longitude to  $10^{\circ}$  east, the abolition of the old Storm Card and the substitution of more modern diagrams and rules, etc.; but this belongs more properly to the next annual report.

Thanking you very heartily for your continued interest in and strong support of the work of this division during the past year, I have the honor to be, very respectfully,

EVERETT HAYDEN,  
*Marine Meteorologist, In Charge.*

The HYDROGRAPHER.

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BRANCH HYDROGRAPHIC OFFICE,  
*Custom-House, Boston, Mass., June 30, 1889.*

SIR: I have the honor to submit the following report of the operations of the Boston branch of the Hydrographic Office for the year ending to-day.

No efforts have been spared to increase the popularity and to improve the standing of the office with the maritime community of this section of the country. Much of the success which has attended our efforts in this direction has been due to the courtesy and consideration of ship-owners and agents, and the encouragement and assistance they have given us in carrying out our various plans for the benefit of sea-faring-people. There can be no doubt whatever that the excellent record made by the branch offices has more than justified their establishment; they have dropped into a place in the maritime community from which they are not to be easily dislodged, and it is greatly to be regretted that they have not had more generous support from Congress. Much of their usefulness is practically destroyed by the meager appropriations made for their support, and the full limit of their value can not be reached until this state of things is remedied.

The Boston office labors under peculiar disadvantages compared with those located in the other cities, in that there is no maritime organization in our city, consequently much time is lost in transacting business with shipping people, in running about to the several offices, the greater part of which would be saved were there some central organization in which we could meet the members of the shipping community. The Chamber of Commerce has a very small maritime representation; the natural consequence is that it is next to impossible to induce it, as a body, to take any action looking to co-operation with or assistance for our office.

Early in September, 1888, Ensign H. S. Knapp, U. S. Navy, was ordered to this office as assistant, and through his exceptional ability and indefatigable labors we were enabled to institute reforms and alter the

methods of handling and arranging the various publications, has been impossible previously owing to insufficient facilities. His excellent work and systematic arrangements, the labor and reception, sorting, and issue of our supplies has been maintained. His ability and exceptional fitness for the work was a very marked degree in his intercourse with the masters of vessels visiting this office, to all of whom, from the highest to the lowest, he was always the same, courteous and obliging, and above all was eminently able to discuss intelligently all questions of nautical science. It gives me pleasure to testify to his worth, and to state that it is through the influence of such men that the branch hydrographic offices can be brought to and maintained at the high standard of efficiency aimed at by their founder.

Ensign Knapp was detached from the office in the latter part of November, 1888, since which time the office has been without an assistant. In the month of January of the present year, at your request, through the courtesy of the collector of the port of Boston, extra space in the rotunda of the custom-house was allowed for the use of this office; two cases for charts and notices to mariners were placed in this space, and it is proposed at the earliest possible opportunity to move the chart and issue departments of the office to the new building, retaining the present office as a private office in which to receive calls and calling for special purposes or requiring particular information. In order to perfect this most desirable plan it is absolutely necessary that the force of the office be increased to a small extent; our present assistant boy has proved very efficient, and it is my desire to retain him in the office and place him in charge of the annex; to take his place as assistant boy, at a smaller salary, should be allowed for running errands, etc., for the office, etc.

The work of ship visiting has been carried on steadily and very successfully by the regular ship visitor, Mr. Lee. A certain system is absolutely necessary in the prosecution of this work owing to the wide separation of the various sections of the coast and consequently it has been the custom to devote certain days to certain sections of the city. There are usually enough vessels at these localities to more than occupy all of one man's available time on one day; the result of this is failure to visit all the arrivals, consequent great and unavoidable loss of data which would frequently be of value to us in the prosecution of our work. The influence of ship visiting on the general condition of the office has been very marked during the past year; for several weeks in the spring our ship visitor, Mr. Lee, was incapacitated by illness, and his absence at home the work of visiting was of necessity suspended, the falling off in the number of callers at the office during this time was very noticeable, indicating plainly the wisdom not only of continuing the work, but of extending and improving our facilities for information, and providing against even its temporary suspension. It is hoped that in the course of time the resources of the office will be increased by the employment of a steam-launch for ship-visiting, which is the only way in which we can hope to keep reasonably abreast of arrivals; in the meantime the office should be allowed the services of a second ship visitor.

Early in December, 1888, by an agreement between the Hydrographic Office and the Chief Signal Officer, U. S. Army, a system of co-operation was inaugurated between the branch hydrographic offices and the Signal Corps.

the voyage. If practicable it would be well to represent the latest reported positions of the fishing fleets on the chart, for the benefit of those steamers bound to the Gulf of St. Lawrence or Halifax. From conversations had with the masters of steamers who cross the Banks it would seem that they have a greater dread of the passage on account of the fishermen on the Banks than on account of the ice to the eastward.

The Supplements to the Pilot Chart have proved most valuable, and we have daily evidence of the estimation in which they are held.

The Supplement, published in August, 1888, was in great demand, being especially interesting as showing the entire voyage of the abandoned *Leary* raft, and as also showing the drift of certain of the best-known derelicts about the ocean.

The Supplement to the February Pilot Chart, showing the drift of the derelict schooner *W. L. White*, met with immediate and very general favor, so much so that the supply for this office was entirely inadequate to the demand. We are receiving calls for them even at the present time.

The number of returns of "Form 105," Greenwich noon observations, has greatly increased during the past year. There were issued from this office during this period something over five hundred sets of the form. With very few exceptions each set has been accompanied by a careful verbal explanation of the object of the record and the method of keeping. The majority of vessels taking the form have kept the record, and of the six hundred odd records turned in at this office during the year, by far the great majority have evidenced a perfect understanding of the requirements.

Nautical Monograph No. 5 was received with great favor by sea-faring people, and we have heard nothing but words of commendation and praise for the publication and the office issuing it. Up to the present time we have received no suggestions for its improvement or correction; its issue seems to have had a most excellent effect on the observers for the office in rendering them more careful in their work and more ambitious to have their records of the greatest possible use to us.

But few copies of the Meteorological Journal have been issued during the year just closed, for the reason that only an occasional captain can be found who is willing to undertake the work of observing and recording so frequently as is required in these books.

The Hydrographic Office is to be congratulated on the activity it has shown in getting out new charts during the year; the charts are highly appreciated by all who see them, and it is to be hoped the work will be prosecuted until we find ourselves independent of foreign offices. We have many calls for charts of the harbors of Nova Scotia, and as I find the preference is generally given to our charts, I would urge the greatest possible dispatch in completing the cartography of this part of the American coast.

There has been more or less demand for charts of the Parana River up to Rosario, to which port many vessels go from Boston, with every prospect of the number increasing yearly.

The port of La Plata on the Rio de La Plata is a growing place and promises to be the port of the river before many years are gone. Steps should be taken to obtain full and reliable information concerning the place, as many vessels will undoubtedly be deterred from going there owing to the lack of accurate information.

The chart of Sunda Strait is most excellent, and will undoubtedly find a ready sale among masters of vessels bound to the East Indies.



coast signal offices, with a view to the extension of the knowledge and influence of the Hydrographic Office and the widening of the field of its labors. So far as this office is concerned the plan has not worked as satisfactorily as had been hoped for. The signal officers in Eastport and Portland have their time pretty thoroughly occupied with their own duties, and the hour set apart as the daily quota of time to be devoted to work for the Hydrographic Office, though all that can be reasonably expected, is utterly insufficient for the purpose. As regards Eastport there is little to be expected, consequently little to lose, but Portland is well worthy of more attention than can possibly be given it under existing conditions, and is capable of rendering better returns. A sub-office should be established in the latter city at the earliest possible moment, to be under the general direction and supervision of the Boston branch office, and to transact all its official business through the latter office; suitable quarters could undoubtedly be obtained for the suboffice, free of rent, in one of the Government buildings located in the city, so that the expense of the establishment would be moderate.

In the latter part of November, 1888, a meeting of the officers in charge of the Atlantic coast branch hydrographic offices took place in New York, the object being to secure as much uniformity as possible in the methods of the various branches. Many points of difference were developed by which certain of the branches were made to appear to much greater advantage than the others. The fact was likewise established that no two of the officers kept their records alike, and while not a matter of vital importance, it is essential for purposes of just comparison that the methods of recording should be similar in all the offices. One point on which it was found a very great difference of opinion existed was the matter of unusual phenomena; events were recorded in some of the offices as unusual phenomena which appeared on other records under entirely different headings. The weekly and yearly reports should conform as nearly as possible in arrangement and headings with the daily records, and this latter should be so itemized as to leave no room for misunderstanding as to which heading each report should come under. These meetings between the officers in charge of the branch offices should take place each year, as I have reason to believe there is much good to be derived from them.

The Pilot Chart of the North Atlantic Ocean continues to hold its place in the estimation of sea-faring people; indeed, it has become an indispensable feature of the outfit of most vessels sailing from this port. The various improvements which have been made in its construction and arrangements during the past year have greatly added to its efficiency and usefulness, and have been thoroughly appreciated by those who make constant use of it.

The wisdom and persistence of the Hydrographic Office in recommending certain transatlantic routes is slowly but surely gaining universal acknowledgment from masters of the merchant marine, and it is to-day decidedly the exception for a steamer coming from Europe direct to Boston to cross the banks during the "ice" season.

Some of the converts to the practice recommended by the Hydrographic Office in this matter of routes are men who, two years ago, would not listen to a word of advice from us, and apparently paid no attention whatever to the recommendations set forth on the Pilot Chart. To-day these men, or at least a great majority of them, appear to have fallen into line with those who believe in taking their ships over a route which will insure the least possible risk, without unduly lengthening

I would suggest that the series of Hydrographic Office Charts numbered 796, 797, 798, 799, be continued to extend as follows:

To include the entire Straits of Molacca and the west coast of Sumatra to the westward, to be carried south to about  $12^{\circ}$  south latitude; to cover the entire group of the Philippine and other East India islands as far east at least as  $135^{\circ}$  east longitude, thus insuring charts on a large scale of all the passages among the islands. Charts of Torres and Bass Straits would also undoubtedly find a ready sale. The general charts of these regions at present on issue by the Hydrographic Office are invariably found fault with as being on too small a scale to be serviceable.

This office has been called upon of late for information concerning the number of certain of the United States light vessels, and an investigation has revealed the fact that the numbers are not given in all instances, either in the United States Light lists or buoy books. The Light Book for 1889 numbers some of the vessels which were not numbered in the list for 1888, but there are still some omissions in the former.

In printing the catalogue of hydrographic publications in future—or at least in the case of those intended for use in the branch hydrographic offices—I would recommend the insertion of blank pages alternating with the regular printed pages; the former to be suitably indexed and ruled for inserting the numbers, titles, prices, etc., of new publications. It is necessary in our office to observe as much system as possible in cataloguing new charts, in order to avoid confusion and to facilitate the locating, by means of the catalogue, of any particular chart. With the present catalogue, after filling up the spaces at top, bottom, and sides of certain pages with the numbers, etc., of new charts, we are obliged to seek room elsewhere, with the result that charts of entirely different parts of the world are entered on the same page, and there is often great delay and confusion in finding what we are looking for.

For the past six months the Boston Post, in common with the New York Herald, has been publishing the abstract of the pilot chart and all printed matter connected with it, and we have reason to believe it is having a most excellent effect in advertising the office. It disseminates the information contained on the chart much more generally than would otherwise be the case, and at the same time undoubtedly increases the circulation of the Post, thus proving itself a mutual benefit.

In concluding this report, I should wish to extend the thanks of the office to the Treasury Department officials and employes, with whom we are thrown in daily contact, for the universal courtesy and consideration shown us and for the many favors done us.

Our thanks are also due to the various members of the shipping community of Boston, who have always shown the greatest appreciation of the efforts of the office in behalf of the sea-farers and a desire to assist us in every possible way.

From the press we have received constant and unvarying courtesy and kindness, and have never appealed in vain for any assistance it has been possible for its members to afford us, for which we desire to express our great appreciation and obligation.

The resources of the chamber of commerce for obtaining late and reliable information have ever been freely placed at our disposal; we have never hesitated to avail ourselves of its generous offer, and wish here to record our thanks for the courtesy.

The following table represents, in detail and in aggregate, the work of the office during the year:

	1888.						1889.					
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.
Vessels visited .....	60	247	205	269	273	210	223	209	73	196	174	2
Vessels taking meteorological journals.					1		1			2	1	
Vessels turning in meteorological journals (filled).					1		1					
Meteorological journals issued.					1		1			6	3	
Meteorological journals turned in (filled).					2		1					
Form 105 (sets) issued to vessels.	37	45	30	38	45	79	70	60	37	23	23	1
Form 105, records turned in.	76	56	54	58	62	47	66	48	47	50	46	1
Barometers compared or adjusted.	56	164	139	151	190	170	206	206	160	277	221	2
Thermometers compared.						1					1	
Meteorological charts furnished vessels.								24				
General sail charts of the world furnished vessels.		2										
Sailing charts corrected for masters of vessels.		1			4			1		2		
Pilot charts distributed.	700	588	744	438	515	635	805	727	523	624	634	24
Supplements to the pilot chart distributed.	1,233	1,713	1,165	482	640	1,049	2,686	1,492	1,321	2,223	2,120	2
United States light-lists distributed.	116	180	87	97	107	87	160	35			106	
List of beacons, bouys, etc., of the United States, distributed.	598	745	342	461	502	353	2,156	717	141	340	226	11
Hydrographic office notices to mariners, distributed.	8,380	11,690	7,532	7,950	10,094	7,950	17,673	16,937	13,967	17,616	12,421	
Coast Survey notices to mariners distributed.												
Telegraph charts of the world distributed.												
Information furnished to individuals.	1,411	1,751	1,701	1,205	847	1,503	1,921	2,181	2,052	2,226	2,162	1
Pamphlets distributed:												
Use of oil at sea.	89	115	47	18								
West India hurricanes.	73	119	81	52	66	8						
Annual report of the Hydrographer.												
Rules of the road.	8	156	88	103	121	204	122	112	74	116	123	1
Reports received and forwarded to Washington:												
Storms.	15	15	25	43	64	47	46	36	18	33	16	1
Limits of trade winds.	25	56	40	31	35	27	50	46	11	37	45	1
Fog.	38	33	23	23	21	6	15	11	16	26	27	1
Ice.	10	11	3	4	4	1		1			5	1
Water-spouts.	3	4		4	4	1		2		1	1	
Abstract of vessels lost.	2				2	2	2					
Wrecks and wreckage.	23	24	0	23	18	9	20	12	7	19	20	
Bouys adrift.	1	1		4	8	1	1		4			

	1888.						1889.						Total for year.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
Reports received and forwarded to Washington—Continued.													
Letters on the use of oil at sea.....		2	.....	2	1	5	1	1	1	4	.....	.....	18
Electric storms and other electric phenomena.....	6	6	2	.....	2	13	11	1	1	3	2	8	55
Whirlwinds.....		1	.....		1	.....	1	.....	.....	.....	.....	.....	3
Eclipses of sun and moon.....		2	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	3
Current reports.....		1	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	2
Tide-rips.....		1	.....	1	.....	.....	.....	1	.....	1	.....	.....	4
Whales.....	2	5	5	3	1	1	.....	.....	.....	2	4	3	26
Submarine earthquakes.....										2	.....	1	3
Shoals.....	1	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	2
Unusual phenomena.....		1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
General information.....													4

Very respectfully,

JOHN DOWNES,  
*Lieutenant, U. S. Navy, in Charge.*

The HYDROGRAPHER.

BRANCH HYDROGRAPHIC OFFICE,  
*Maritime Exchange, New York, July 1, 1889.*

SIR: In obedience to your orders, contained in circular letter No. 2304, I have the honor to submit the following report of the operations of this office during the fiscal year ending June 30, 1889.

Lieut. V. L. Cottman, U. S. Navy, whose energy, tact, and sound judgment have placed the New York branch hydrographic office in its present enviable position, was detached on March 15, 1889, and ordered to sea. He left behind him a record of duty ably performed, and carried away with him the best wishes of all who are interested in the welfare of this office. As his successor, it has been my endeavor to carry out the system which he inaugurated and which was the result of years of thought and experience. A few minor changes, however, have become necessary owing to the want of funds and the consequent reduction of the working force.

While the branch hydrographic office in this city has assumed a position of great importance to the public generally, it has become an absolute necessity to the maritime and mercantile community. Although established and operated for the purpose of supplying useful and necessary information to the sea-faring public, its operations have been extended and its scope enlarged to such an extent that it is now looked upon as a "general intelligence bureau," and is called upon to supply information to almost all classes of people and on an endless variety of subjects. By the press generally it is regarded as an authority on all matters pertaining to naval and maritime subjects. Admiralty lawyers eagerly seek for witnesses from among its personnel to testify as experts in important cases. Marine insurance companies obtain information from its publications and

records. Passengers about to embark on the ocean steamers information of the latest and most reliable kind before Shipping men write or send for the latest positions of floating ice, and other dangerous obstructions before sending their cargoes to sea, and captains of sailing vessels rarely leave port obtaining a forecast of the weather likely to be encountered off. Besides these routine duties, letters are received daily from all of people requesting information on subjects requiring consideration and research to answer.

It would be impossible to give more than a general idea of the amount or kind of information thus received and distributed during the year. Besides continuing the collection of data recorded in the past, information has been collected and forwarded on the subject the tracks of ocean steamers at different seasons of the year; the best and best routes to be pursued by sailing vessels from port to port; the latest positions and condition of the numerous floating derelicts; the most reliable data relating to the various phenomena of the weather including hurricanes, cyclones, water-spouts, fogs, currents, ice fields, ice-fields; information relating to the weather at different dates at various parts of the world; data relating to the compensation of the passes; the habits, speed, and uses to which carrier pigeons can be put; the soundings in various portions of the ocean and inland water; the temperature and densities of water in the different harbors of the States; the location of sunken wrecks, shoals, and other obstructions; the condition and position of buoys, lights, beacons, etc., both at home and abroad; information concerning the latest inventions and kinds of nautical instruments; information on the subject of patents and proposed methods of utilizing oil for quelling fires at sea, and legal points relating to the authority of private property corporations to construct bridges over the navigable waters of the States.

The collection and forwarding of the above data constitute a small portion of the regular routine work. Important information has also been obtained and forwarded for the use of various other departments, bureaus, and boards, including the State Department, Treasury Department, Bureau of Intelligence, Light-House Board, etc. Communications for information have not been confined to this country for many requests come from abroad, especially from the different hydrographic societies of Europe. To give some idea of the increase in the operations of this office during the last fiscal year it is only necessary to state that 2,368 sets of Greenwich Noon Reports have been issued to observers against 1,300 issued the previous year; and that of these forms properly filled in have been received and forwarded contrasted with 1,752 received and forwarded last year. Notwithstanding this great increase of 85 per cent. in the number of reports it should be remembered that during the latter half of the year all the envelopes issued with Form 105 have been addressed to the Hydrographic Office in Washington, and a large proportion of reports which were formerly sent to this office now go directly to the Department. A still further comparison will show 1,106 special reports of storms, 1,204 special reports of fog, 868 storms, 833 trades, and 978 fog reports compared with 868 storms, 833 trades, and 978 fog reports last year. This shows a total gain of about 33½ per cent. over last year. In considering the amount of data distributed it will be seen that 124,529 copies to Mariners have been issued against 124,529 of last year, a trifle over 100 per cent. A glance at the tabular

respondence of this office will show that 1,000 miscellaneous letters have been received and 5,657 letters, acknowledgments, etc., have been written.

The compilation of data for the Mascart Cablegram, which was discontinued on the 19th of October, 1888, was recommenced on the 1st of May, 1889. Owing to the extension of the time-limit from five to seven days, and to the very large amount of meteorological data received at this office daily, much of the time of the officer in charge is occupied in this work. These reports must be mailed by noon of each day, and as the whole of the forenoon is occupied in the compilation and correction of the data to be contained in these cablegrams, the consideration of other important matters must be postponed until the afternoon.

Circular letters have been written to masters of vessels navigating the Gulf of Mexico and West Indian waters, requesting their opinion as to the advisability of placing a light on Matanilla Shoal, and asking for practical suggestions on the subject. In answer to these letters a large number of replies have been received, containing much valuable information. It has also been possible to obtain the opinions of a great number of practical shipping and sea-faring men who are thoroughly familiar with these waters. While the opinions differ slightly as to style, color, and height of proposed structure, and as to the color and order of the proposed light, the captains and shipowners are all unanimous in their opinion as to the great desirability, and, in fact, the absolute necessity, of placing a light somewhere near this shoal.

A large amount of information relating to the various steam-ship companies having agents in this city has been collected and forwarded to the Department. As the sailing dates, rates of fare, etc., are constantly changing, this data has to be added to from time to time in order to keep the records corrected up to date.

Much valuable data relating to the steaming and maneuvering powers of ocean steamers of all classes has been collected and forwarded to the office of naval intelligence. Since February 28, the captain of every steamer entering this port has received a letter requesting this data. In many cases the captains were not allowed by their instructions to give the desired information. Notwithstanding this, however, over eighty captains have written to this office forwarding the information desired, and many others have called to explain why it was impossible to comply with the request.

Much interest has been taken in this vicinity in the proposed International Marine Conference, which meets in Washington on the 16th of October. In order to obtain practical suggestions for the use of the American commissioners, circular letters have been issued by this office to all parties directly interested in this matter, and much valuable information has already been obtained. Captains of sailing vessels and of steam-ships, ship owners, ship-builders, admiralty lawyers, marine insurance companies, and parties familiar with life-saving appliances have all been appealed to for their opinions and suggestions. It is believed that much valuable data will be collected from these sources.

At the opening of the yachting season letters were written to all of the principal yacht clubs in this vicinity, placing the records of this office at the disposal of the yachtsmen and requesting them to co-operate with the office in obtaining and forwarding meteorological and other data. As a result, we have obtained quite a number of intelligent and enthusiastic observers.

Efforts have been made to obtain observers from among the pilots and captains of coasting vessels with very little success. While ac-

knowledging the importance of this work, they state that it is impossible to keep the forms as they should be kept, as they have no time to take observations themselves, and can not depend upon their subordinates for this purpose. The captains express themselves as being perfectly willing to make special reports of anything of importance which comes under their observation, but positively decline to keep Form 11. The result is that we have very few observers among this class. A special form is needed for distribution among the coasting vessels generally. This form should not include meteorological observations, but should call for reports of such special occurrences as buoys out of place, wrecks, derelicts, lights out of order, or light-ships out of position, &c. An effort has been made to accomplish this object by distributing a number of the large printed franked envelopes stamped as follows:

U. S. BRANCH HYDROGRAPHIC OFFICE,  
NEW YORK.

Please mail this envelope with report of  
any derelicts, buoys adrift or out of place,  
wreckage, ice, storms, water-spouts, or  
other unusual phenomena.

These envelopes thus stamped have been placed on board of all the pilot boats in this harbor, and have been forwarded to Sergeants O'Connell and Daniels, with the request that they be distributed among the coasting vessels calling at New Haven and New London. It is believed that in this way many reports are made to this office which would otherwise be neglected.

The popularity of the Hydrographic Office publications has increased to such an extent that it has been impossible to supply the demand. Pilot Charts particularly are highly valued, not only by shipping people but by the public generally. It is getting to be the custom for parties about to sail on the transatlantic steamers to call or send for a copy of the Pilot Chart before leaving. Owing to the lack of funds it has become necessary to cut down the list of people who receive the Pilot Chart. This reduction has been made from time to time, and only the regular observers and parties directly interested in shipping matters are now retained on this list. Although the greater number of these people are supplied directly from Washington, the number of Pilot Charts issued from this office has reached 1,400 each month. It has lately become necessary to cut down this number still further, and to charge all parties excepting the regular observers for this office, the nominal price of 10 cents for the charts. Notwithstanding this fact the demand for the charts is still on the increase.

During the year Pilot Charts have been distributed among all the life-saving stations along the coast, and are greatly appreciated by the recipients.

The great Joggins raft, which broke adrift from the steam-ship *Meranda*, on December 8, 1887, and became such a great menace to navigators, experienced a series of severe northwest gales, which broke it up and drove the scattered portions across the Gulf Stream and started them on their long voyage to the eastward. The large amount of data on this subject collected by the various branch offices, and which was issued to the public in the August supplement to the Pilot Chart, has been a subject of surprise and admiration to many. The issue has been in great demand, as it afforded a graphic and interesting illustration of the direction and force of the prevailing winds and currents in the North Atlantic.

Among the most popular publications issued by the Hydrographic Office during the year was the March Pilot Chart, containing diagrams and directions for the use of oil in calming heavy seas, taken from Captain Karlowa's prize essay on the subject. This chart has been distributed amongst all classes of sea-going people, and has already been the means of saving many lives and much property during the very stormy months of March and April and the early part of May.

The use of oil at sea is now becoming so universal that it is quite difficult to obtain reports. The very men who a few years ago laughed at the possibility of utilizing oil for the purpose of smoothing dangerous seas, now use it as a matter of course, and do not think it of sufficient interest to even make a report of their experience in regard to it. These men are now the most bitter in denouncing others for their disbelief.

There has been a great demand for the oil pamphlet, the supply of which was exhausted early in the fiscal year. It is to be hoped that a new edition of this pamphlet may be issued soon, as we have many requests for it from navigators.

It is believed, however, that much may still be learned as to the most suitable kind of oil, and the best methods and appliances for using it for this purpose. Opinions on this subject should be sought from among those captains who habitually use oil on board their ships. Our attention has been called to several patent appliances for the use of oil, but we have had neither time nor opportunity of testing their respective merits.

The bottle-report blanks, which were received in October, have all been distributed among the observers of this office. These blanks have been placed in bottles and thrown overboard from the vessels in various parts of the world. Already a number of them have been recovered and forwarded to Washington, and will be the means of furnishing valuable data regarding ocean currents. The new form has met with great success, and is universally appreciated by our observers; and, being printed in several languages, is much more comprehensive and valuable.

In January of this year the first edition of the pamphlet on the subject of the great March blizzard (Monograph No. 5), was received; a hundred copies were at once distributed and met with universal favor. They were eagerly sought after by all classes of people, and the demand was not in anyway confined to shipping or sea-faring persons. Notwithstanding the fact that these copies were only issued to our observers, it has been impossible to supply the demand, and though numerous editions have been issued since, the demand seems to be still on the increase. This book is studied by scientific men of all nationalities with great interest. Our voluntary observers greatly value this Monograph, because it shows them that their work is both appreciated and utilized by the Hydrographer. It also gives them an opportunity, which they never had before, of studying the cause, origin, and effect of circular storms.

The graphic and interesting record of the remarkable cruise of the derelict American schooner *W. L. White*, as contained in the February Supplement, has attracted world-wide attention and interest. The completeness and promptness with which this publication was placed before the public has been a source of gratification to all who are in any way interested in maritime matters. The demand for this Supplement still continues.

The small supplements, containing graphic representations of West Indian cyclones and hurricanes and the new storm card, are being



studied by navigators with great interest. Good results are sure to follow the issue of this well-timed supplementary publication.

The completion of the set of Gnomonic Charts of the World is a subject of congratulation to the Hydrographic Office. The Gnomonic Chart of the North Atlantic Ocean is now used by all the great transatlantic steamers. The corresponding charts of the Pacific and Indian oceans are gaining daily in popularity and are highly valued and appreciated, while the use of the other charts is steadily on the increase.

Some greater distinction should be made between observers and non-observers. The only difference now made is that observers receive a copy of Monograph 5 and also such Hydrographic Office charts as can be spared them, while non-observers are only given Pilot Charts, Notices to Mariners, etc. If a greater difference could be made between these two classes many would be encouraged to become observers.

The Conference of Officers in charge of branch offices, which was called by the Hydrographer to consider the best means of increasing the efficiency of the hydrographic service and of securing uniformity in its methods, met in this city on November 23, 1888. A detailed report of this conference has already been forwarded to Washington. Among other things proposed, and afterwards carried into effect, was the subdivision of all the navigable waters of the globe into thirteen districts for the purpose of facilitating the collection and distribution of information. The sea-coast of the United States and British America was also divided into sections, each section being placed under the charge of one of the branch offices. This allotment of a particular section of sea-coast to each office greatly facilitates the work of collection and distribution. Notices to Mariners are now put up in bundles and are handled with greater facility and distributed to much greater advantage since this system went into effect.

It has been the aim of this Office to secure from each vessel visiting New York some kind of information regarding the weather encountered on their last voyage. If they are willing to keep Form 105, we supply them with the necessary blanks; if they are not able to do this, but are willing to send us some special information, we always try to give them an opportunity of so doing. To avoid missing any one, and to see that every captain is asked for something, requires a vast amount of letter writing and consumes much time. To devise some means of reaching these people, with the least amount of work, has been the subject of considerable thought and investigation. The experience of this office, as well as that of business men generally, is, that a printed letter-form receives little or no attention from the recipient, but is immediately thrown away, while a personal letter is generally read and receives more consideration. In the beginning of the present year it was the custom to write a special letter on the typewriter to each captain arriving in this port who did not keep Form 105, requesting information regarding the wind and weather encountered on his last voyage. This entailed a great amount of work and occupied considerable time. To shorten this as much as possible, the neostyle, a machine which will reproduce 2,000 copies from one impression, was purchased. Special letters are now typewritten, asking for information regarding gales, trade-wind, etc., and are then reproduced by this instrument. Blank spaces are left for the address, date, and the names of the ports sailed from and the ports arrived at. These letters have been of great benefit to the office in the collection of marine data, as they are sent to masters of vessels who are not regular observers and who otherwise would give us no information whatever. The blank spaces mentioned above can be filled in with

the typewriter in about one-tenth of the time formerly taken to typewrite the letter, and as a similar color of ink is used, it would take an expert to detect the difference. In this way the work of collecting data has been much simplified and it has been possible to greatly increase the correspondence without impairing its efficiency.

In this connection I would respectfully call attention to the following blank forms now used in this office for soliciting data, and would recommend that all blank letters of acknowledgment or transmittal used by the offices and its branches be either reproduced in this manner or printed with special typewriter type. This will have the beneficial effect of making each acknowledgment and request sent out from the Hydrographic Office appear as much like a personal letter as possible.

SIR: Having learned from the New York Herald of your recent return from a voyage through the trades, the Hydrographic Office will be greatly obliged if you will fill out the accompanying trade-wind blanks and return them to this office in the franked envelope inclosed, which requires no postage-stamp. The blanks are for your voyage to and from.

Whenever it may suit your convenience, I will be pleased to see you at this Office, where you can consult, free of charge, charts, sailing directions, light lists, etc., corrected to date, or any information of a nautical nature.

Very respectfully,

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*U. S. Navy, in charge.*

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I take great pleasure in inclosing you a copy of the "Programme of subjects to be considered by the International Marine Conference," which meets in Washington next October for the purpose of formulating a new code of international laws relating to the safety of life and property and life at sea. The subjects to be considered by this conference are of the very greatest importance to the owners, agents, and officers of vessels.

It is the earnest desire of the Hydrographic Office to obtain the opinions of all persons interested in shipping, with the intention of formulating such practical reports for the assistance of the members of the American Commission.

Will you please assist us, therefore, in this work by requesting the various captains of your fleet to give the result of their experience, and to make such suggestions as they think will improve and simplify the existing laws.

I would respectfully request your personal opinion on such of the subjects as you think may need revision and correction, and particularly upon general divisions 2, 3, 4, 9, 10, and 13.

Very respectfully,

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*U. S. Navy, in charge.*

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SIR: The attention of the Hydrographic Office has been called to the necessity of a light-house on Matanilla Reef, or on Matanilla Shoal, Bahama Islands, at the northeast entrance to the Straits of Florida.

In order to deal intelligently with this subject it is desirable, before taking any further steps in the matter, to obtain the opinions of practical navigators who have had experience in the waters of the Gulf of Mexico and the West Indies.

I have therefore taken the liberty of addressing you, hoping that you will give us the benefit of your observations and experience.

Any suggestions which you may make as to the position, character, shape, height, and material of the proposed structure, or as to the visibility, color, and character of the light itself, will be of great value to the Hydrographic Office, and will be much appreciated.

Very respectfully,

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*U. S. Navy, in charge.*

## OUTWARD BOUND.

*Atlantic Ocean.*

Date of leaving, —, —, —.  
 Wind and weather before trades:  
   Entered NE. trades, date, —, —; lat. —, long. —.  
   Direction of wind, —; force, —.  
   Left NE. trades, date, —, —; lat. —, long. —.  
   Crossed equator, date, —, —; long. —.  
 Wind and weather between trades:  
   Entered SE. trades, date, —, —; lat. —, long. —.  
   Direction of wind, —; force, —.  
   Left SE. trades, date, —, —; lat. —, long. —.  
 Wind and weather after trades:  
 Date of passing Cape Agulhas, —; lat. —.

*Indian Ocean.*

Wind and weather before trades:  
   Entered SE. trades, date, —, —; lat. —, long. —.  
   Direction of wind, —; force, —.  
   Left SE. trades, date, —, —; lat. —, long. —.  
 Wind and weather after trades:  
 Date of arrival at —, —.

## HOMEWARD BOUND.

*Indian Ocean.*

Date of leaving —, —, —.  
 Wind and weather before trades:  
   Entered SE. trades, date, —, —; lat. —, long. —.  
   Direction of wind, —; force, —.  
   Left SE. trades, date, —, —; lat. —, long. —.  
 Wind and weather after trades:  
 Date of passing Cape Agulhas, lat. —.

*Atlantic Ocean.*

Wind and weather before trades:  
   Entered SE. trades, date, —, —; lat. —, long. —.  
   Direction of wind, —; force, —.  
   Left SE. trades, date, —, —; lat. —, long. —.  
   Crossed equator, date, —, —; long. —.  
 Wind and weather between trades:  
   Entered NE. trades, date, —, —; lat. —, long. —.  
   Direction of wind, —; force, —.  
   Left NE. trades, date, —, —; lat. —, long. —.  
 Wind and weather after trades:  
 Date of arrival at New York, —, —.

SIR: One of the principal features of this office is the distribution of naval information to the public. It frequently happens that inquiries are received personally or by letter, as to the sailing dates, routes pursued, time consumed in making passage, fare, cabin accommodations, and such general information as is contained in our circulars. In order to obtain this information it is necessary to write to your office, thus causing delay and consuming much valuable time.

If you will kindly send me two copies of such circulars, sailing dates, plans of routes, etc., as you have on hand for distribution, or may publish from time to time, will assist us greatly in our work. One of these copies will be sent to the Engineer and the other kept on file in this Office.

Very respectfully,

U. S. Navy, to d

A new system of filing letters received and written has been inaugurated in this office during the year with very beneficial results. All letters on the same subject are filed together and are arranged according to alphabetical order, or according to dates. Instead of being compelled to run over a number of books to find a desired letter, and then being very often compelled to give up the search, we can now by means of this system, consisting of a ten-drawer cabinet with patent index arranged to suit our correspondence, produce in a few seconds any letter received or written during the past fiscal year. This saves much time, trouble, and annoyance.

It is to be regretted that want of funds should have necessitated the reduction of the working force of this office. Since the 15th of May, 1889, all of the boarding duty has been performed by one assistant. The immense amount of river-front in this city and vicinity, aggregating about 22 miles, makes it utterly impossible to get over the entire route, excepting at very long intervals. It is now only possible to board and compare barometers, alternating between the North and East River piers. This work would be greatly facilitated at a very small expense by purchasing or hiring a small naphtha launch. Nearly all vessels entering and leaving the harbor, excepting the large passenger steamers, anchor on the Jersey Flats, or off Red Hook in the Upper Bay. If these vessels could be boarded in the stream it would be possible to get abstracts of their logs and to compare their barometers without any trouble or delay, and more vessels could be boarded in one day under these circumstances than could be boarded in a week at the piers. As soon as these vessels haul alongside the dock most of the crew are discharged, and the captain locks up his cabin containing the log-book and barometer and goes on shore to live. The ship is placed in charge of a port captain or watchman, whose orders are to allow no one to enter the cabin. Under these circumstances it is impossible for the boarding officer either to get any information from the log-book or to compare the barometers of the vessels. A small naphtha launch would require no increase in the office force, as the boarding officer could run it himself and would not be compelled to take out an engineer's license, which would be necessary if a steam-launch was used. The amount now expended for car-fares in boarding vessels alongside the dock would go largely towards paying the running expenses of such a launch.

It again becomes necessary to call attention to the difficulty, I may say the impossibility, of carrying on the work of this office in its present quarters. Mr. F. W. Houghton, superintendent of the Maritime Association, in his annual report, dated May 16, 1889, says:

The naval branch hydrographic office continues with us, now in charge of Lieutenant Blow, U. S. Navy. It is invaluable to the Maritime Exchange, which is equally essential to it. Its quarters are sadly cramped, although we have granted it all the space we can afford free of charge. Congress should enable it to extend its usefulness by providing means for its more adequate accommodation.

The space referred to and which is now occupied, free of rent, through the generosity of the Maritime Association, was ample for its needs when it was first established and while it was in the experimental stage. For several years, however, the office has outgrown the space allotted to it. Lieutenant Cottman, in his report of the operations of this office during the fiscal year ending June 30, 1888, says:

The appearance presented by the offices of the New York branch are hardly such as would impress one with the dignity which is an inseparable part of the naval establishment. Not only is this a subject which touches the pride of all concerned,

but it is a matter of personal discomfort, and detracts from the advantageous work of the office. The inside work has so much increased that enlarged accommodations are imperative if the work is to progress as in the years past, which rate of progress indications show, can be maintained with proper quarters, staff, and appliances.

It is certainly not too much to expect that such accommodations should be provided as will secure the requisite quiet and privacy for matters of this sort. It is necessary to see the present quarters to be impressed with their want of adaptability for the service. The office in which the charts are corrected, ships furnished, sailing directions and charts are preserved, and general information given, is even less suited for the purpose than the other. One chart table is alone provided; this is always occupied with necessary work, which must be interrupted when captains are desirous of consulting charts and books as to routes; when one officer is engaged in giving information the space is so limited that all other work must cease; the small quarter allotted prevent more than two or three at a time to seek desired information. When packages are made up of the "Extracts," covering traveled routes, we are forced to utilize any corner or part of the exchange which is not then in use, leaving a certain element in our work. This office requires a large room for which rent can be paid, and a feeling of independence which can not now exist will be sure to follow. This room should be so partitioned that the officer in charge can have a private office, each member of the staff should have a suitable desk or table, and this must include the boarding assistants. When their outside work is completed each day they must still to fill out the forms in regard to barometers compared, to submit their written reports of information gathered, and to do other necessary work which requires a suitable desk. Two chart-tables are as few as can be gotten along with when the work is properly carried on. The sailing directions should have convenient shelves; the chart-chests should be conveniently located, places should be given for stowage of notices to mariners, beacon and buoy and light-house lists—all of which are now crowded that it is a matter of labor to get at them.

Two energetic and efficient assistants, who are interested in the work, will enable the office to keep up its present reputation, as the desire and intention is to increase and not to retrograde, and if proper quarters are furnished ample work can be found to employ a third assistant. The Maritime Association has now for rent a room connected with the floor of the exchange which is in every way admirably adapted to the work of this office. It is our great desire to rent these quarters, and an appropriation for this office of \$7,000 would enable it to procure everything necessary for its proper equipment and rent, and at the same time would place this office on a proper footing, which has so long been the desire of all those interested in its work. The Maritime Association has done all it could consistent with its interests in supplying quarters free of rent, and it is to be hoped that the necessary appropriation will be made.

If this was the condition the 1st of July, 1888, it can be easily seen that it is now much worse, for, as previously stated, the work of the office has increased to such an extent and its scope has been so greatly enlarged that it is now impossible to carry on even the routine work of the quarters, which were originally large enough for all necessary purposes.

The New York branch hydrographic office consists of a narrow strip trailed off along the southern wall of the Maritime Exchange floor. It is 25 feet long by 7½ feet wide. This space is almost entirely occupied by fourteen pieces of furniture, consisting of one chart table, one large desk, three small desks, one set of book-shelves, one water-cooler, one small cabinet, one very large chart cabinet, two instrument cases, and three chairs. This necessary outfit takes up a space of 112 square feet, leaving only 75 square feet unoccupied. In this space, every available square inch of which is utilized, the three assistants are crowded, correcting charts, sailing directions light lists, etc., and going through the routine work of giving information to the numerous ship captains, who call daily. Whenever a visitor comes to the office to consult charts or sailing directions all other work must stop. The chart table, which is also the general work table, must be cleared and the operations of the office are practically suspended until the visitor leaves and the chairs are returned to their shelves. In order to make more room, the door of the chart cabinet has to be unshipped in the morning, thus allo-

ing large quantities of dust to settle on the charts, greatly to their injury. During the last year the number of publications received has been very large, and in order to secure a place to stow them it has been necessary to get permission from the superintendent of the exchange to place them in various parts of the floor and cellar. In making up packages of notices to mariners, etc., for issue, the assistants are compelled to go down into this cellar, thus leaving the main office without any one in charge. The desk of the officer in charge and the typewriter cabinet are placed in a small dark room on the western side of the floor, which is also kindly given us rent free by the exchange. This room, which is only large enough for the two desks, is lighted entirely by gas. On cloudy or rainy days, when it becomes necessary to light the burners on the exchange floor, the pressure of the gas is reduced about one-half. This practically extinguishes the lights in this room and renders them entirely useless. In order to get sufficient light for writing, making out the Mascart cablegram, etc., it is necessary for the officer in charge to occupy a desk on the eastern side of the exchange floor, in the space set apart for the messenger boys of the Maritime Exchange. Visitors coming to the office desiring to see the officer in charge are compelled to hunt through these three places before they can find him and then go on the floor of the exchange, in direct violation of the rules of the association. It frequently happens that foreign naval officers, naval attachés, and other distinguished visitors call at the office for the purpose of investigating the methods employed in collecting and distributing marine data. Such people naturally expect to find an office suitable for hydrographic work and supplied with the facilities commensurate with its importance and the comforts usually in government offices abroad. It is impossible to explain the condition of affairs, as it would seem to be criticizing the methods and usages of our form of government, and the only explanation possible is that we hope to secure better accommodations at an early date. The Maritime Association has a room which will fill all the requirements of this office and which they offer to rent at a very low figure. I most earnestly recommend that an appropriation be secured for this purpose.

On January 3, 1889, Sergt. Paul Daniels, U. S. Army, and Sergt. H. J. Cox, U. S. Army, Signal Service observers, stationed respectively at New London, Conn., and New Haven, Conn., reported by letter to this office, offering their services voluntarily in the work of collecting and distributing information to the mercantile and maritime public. Since that time we have received great assistance and much important information from these gentlemen, whose valuable services and great interest in our work can not be too highly appreciated.

Capt. John McNeil, harbor-master, of Bridgeport, Conn., Captain Townsend, harbor-master, Newport, R. I., and the collector of customs, Providence, R. I., also volunteered their services in this connection, and have been of great assistance to the New York branch hydrographic office in distributing information to vessels visiting their respective ports and calling the attention of ship-masters and ship-owners to the hydrographic service.

It is with much pleasure that I acknowledge the many courtesies extended to this office by the board of directors of the Maritime Association. To the superintendent, Mr. F. W. Houghton, we are particularly indebted for continued kindness and for many valuable suggestions. I would also extend thanks to the various Treasury Department officials, to the pilot commissioners, and to the "Ship News Office" for valuable

assistance in promptly forwarding reports. The numerous ship firms and steam-ship companies have placed us under many obligations by forwarding publications, etc., to our observers in all parts of the world. The press of New York has also contributed greatly to success by calling the attention of the public to numerous existing dangers to navigation and by its kind words of praise and encouragement.

In conclusion I would respectfully call attention to the excellent work of the several assistants in this office, to whose energy and ability success is so largely due.

The following table presents a complete summary of the work performed during the past fiscal year:

	1888.						1889.						Total for fiscal year 1888-'89.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
Information forwarded.....													8,450
Trade-wind reports.....	59	78	65	47	209	105	235	108	91	65	135	87	1,284
Ice reports.....	41	17	9	3	3				1	3	29	35	1,138
Wreck reports.....	123	106	89	54	57	43	47	43	46	75	72	81	832
Fog reports.....	200	184	135	85	85	45	28	43	62	74	168	144	1,204
Storm reports.....	37	57	70	107	128	218	113	118	98	86	43	81	1,106
Use of oil in storm.....	1	1	1				3		2	2	2		15
Current reports.....	2	1	1			2	2	1	1		1		11
Meteor reports.....	1	7	5		1	3	1	2	2	2	3	5	22
Water-pout reports.....	7	1	3	5	1	3	4	1	2	1	3	10	57
St. Elmo's Fire.....			1			3		1			8		3
Tidal-wave reports.....	1			3									4
Tidal-rip reports.....	4					2		1		1	6	1	20
Whale reports.....	2	5	2										4
Depth of water.....													2
Signal reports.....			4					3	1		1	2	11
Visibility of lights.....	2												2
Buoys out of place or adrift.....	10	18	3	5	9	5	5	4	6	15	20	3	102
Light-ships out of place or adrift.....													2
Obstructions to navigation.....	1			3									4
Meteorological journals.....	8	3	5		4				8	4	5	9	54
Greenwich noon reports.....	246	367	318	326	238	289	283	258	244	216	284	239	3,218
Astracrafts of logs.....	19	29	31	37	45	28	27	18	25	14	43	33	329
Track charts.....						2	1	1	1	2	2	2	14
Barometer curve.....													6
Wind curve.....													5
Articles distributed.....													297,131
Pilot charts.....	1,099	1,345	1,432	1,695	1,384	1,325	1,303	1,085	1,238	1,086	1,203	980	15,065
Weekly Supplements.....	1,013	1,705	625	662	723	610	760	605	620	615	795	640	9,983
Notices to Mariners.....	10,432	13,173	17,706	20,700	30,275	24,540	34,575	15,974	31,670	18,906	24,398	19,341	261,690
Light Lists.....			50	79	84	65	61	24	48	25	76	107	703
Buoy and Beacon Lists.....	165	118	194	391	398	317	238	102	208	74	155	71	2,331
Meteorological journals.....	3	13	3	3	4			3	3	11	3	2	23
Forms 105 (sets).....	214	3	319	210	160	189	295	178	187	147	127	183	2,366
August Supplements.....							61	51	41	19	6	1	1,789
February Supplements.....		1,063	191	135	94	78		787	895	23	16	18	1,239
Pamphlets.....	196	190	211	94	84	67	92	82	91	74	277	181	1,659
H. O. Charts.....	55	34	15	37	18	39	11	11	18	35	14	19	296



	1888.						1889.						Total for fiscal year 1888-'89.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
Work performed:													
Vessels visited.....	544	580	532	675	538	435	502	446	479	502	593	622	6,468
Barometers compared.....	290	302	380	327	295	246	201	185	221	221	209	192	2,069
Thermometers compared.....	64	64	76	49	18	.....	.....	4	.....	2	1	4	283
Letters of acknowledgment issued.....	250	327	249	311	235	309	301	273	205	217	307	269	2,313
Trade-wind letters written.....	18	13	13	44	58	100	57	39	47	39	53	54	735
Storm letters written.....	.....	.....	.....	7	57	228	154	128	93	67	1	.....	735
Letters requesting miscellaneous information.....	.....	.....	.....	4	5	8	2	1	11	46	87	5	114
Letters regarding steaming power of vessels.....	.....	.....	.....	193	207	253	227	10	228	99	28	26.8	865
Miscellaneous letters.....	149	136	151	.....	.....	.....	.....	180	203	211	217	30	2,844
Charts corrected.....	33	29	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	92
General information furnished.....	5,665	6,730	5,550	6,675	6,420	5,300	5,470	5,185	6,670	5,185	6,750	5,539	71,135

Very respectfully,  
The HYDROGRAPHER.

GEO. P. BLOW, *Ensign, U. S. N., in charge.*

BRANCH HYDROGRAPHIC OFFICE,  
*Maritime Exchange, Philadelphia, Pa., July 1, 1889.*

SIR: I respectfully submit the following report of the operations of this office for the fiscal year ending June 30, 1889:

The Pilot Chart, weekly supplement to the same, and other similar publications of the Hydrographic Office still retain their popularity, as is shown by the increased demand for them. The laws of storms, published from time to time on the chart have increased its value, also the illustrations of the use of oil in heavy seas, storm signals, etc.

The meeting, or conference, of the officers in charge of the branch offices on the Atlantic coast, last November, was of great benefit to them, as they were enabled to confer freely, formulate plans for doing work in the same manner, allot certain parts of the Atlantic coast to the several offices, so that vessels in the same port would not be communicated with by two or more offices, etc. Upon the recommendation of this conference the Fourth and Sixth Light-House districts were assigned to this office, and the masters of all vessels at ports in these districts have been communicated with, information requested, and forms for keeping observations sent them. In many cases favorable answers have been received, with data of use to the office. I would recommend that another conference of the officers in charge of the branch offices be held this coming fall, either at New York or Philadelphia.

In November last the U. S. Signal Service observers in charge of the offices at Wilmington, N. C., Charleston, S. C., and Savannah, Ga., began to co-operate with this office, and since that time have been of valuable assistance in getting masters of vessels at these ports to take observations for the Hydrographic Office, as well as in forwarding reports and in comparing barometers.

Sergeant F. P. Chaffee, U. S. Army, at Wilmington, has boarded 73 vessels, compared 71 barometers, and forwarded 48 storm reports, 31 trade winds, 6 wrecks, 1 fog, and 1 buoy adrift.

Sergeant J. C. Smith, U. S. Army, at Charleston, has boarded 30 vessels, compared 27 barometers, and forwarded 6 storm reports, 4 wrecks, 2 trade winds, and 1 use of oil in storms.

Sergeants M. J. Wright and C. F. von Hermann, U. S. Army, at Savannah, Ga., have boarded 115 vessels, compared 103 barometers, and forwarded 13 wreck reports.

The Maritime Exchange of this city has kindly allowed its agent at the Delaware breakwater to act for this office, and during the year he has boarded 61 vessels, forwarded 15 wreck reports, distributed 35 light lists, 251 buoy books, and 14 Forms No. 105. He is kept supplied with the latest information in possession of the office regarding changes of lights, buoys, and dangerous wrecks along the coast, and has frequent calls for information from masters of vessels anchoring at the breakwater.

On April 1 this office was moved into new quarters, on the floor of the Maritime Exchange, in the Exchange building, corner of Third and Dock streets, and now has increased air, light, and space. It should have a full set of charts and sailing directions of the world, so that all known information could be given immediately when required. Masters of vessels frequently call for information concerning ports of which there is no authority at hand, and before an answer can be received from the main office the charter is lost.

When the office was moved all connecting wires of the time-ball were cut, and since that time it has not been dropped. The instrument for

dropping it, the wires, etc., are in good condition, and with very little expense could be put in working order. There are two offices of the Western Union Telegraph Company in the Commercial Building, one on the roof of which the ball is located, which receive the signals at noon, and by connecting the wires of the ball with one of the offices it could be dropped by some one sent from this office. Attempts were made to have the time-wire connected with the ball, but no one in this city seemed to have the authority to order it done.

The information regarding the derelict *Ottawa* contained in a circular of June 4 was given to the agent of the Red Star Line of vessels by this office, and the owners, Messrs. Peter Wright & Sons, of New York City, decided to send their tug *Argus* in search of her, with directions to tow her in if possible. The *Argus* sailed from Boston, Mass., on June 10, but owing to thick weather failed in the search. She returned to Boston, coaled and again sailed, succeeded in finding the wreck, and towed it into Boston.

The following extract from the report of the board of directors of the Philadelphia Maritime Exchange, 1889, will be of interest:

#### BRANCH HYDROGRAPHIC OFFICE.

To this department of the Government much increased accommodations have been given in the new rooms, and the work is efficiently carried on by Lieut. W. P. Felt, U. S. Navy, assisted by Ensign H. B. Wilson, U. S. Navy.

The branch Hydrographic offices, established under the auspices of the Navy Department at the principal sea-ports of the United States, are of very great value to the maritime community of the whole country, and of collateral benefit to the kindred interests, rendering material and important aids to commerce.

A resolution was adopted by the board on December 18 last that Congress be urgently solicited to grant such appropriations for the support of this department as would unquestionably insure the maintenance of at least the present efficiency and usefulness. An appropriation was subsequently made by Congress of \$12,000 for the maintenance of nine offices, although \$20,000 was asked as a minimum for properly conducting the business connected therewith.

The thanks of this office are due to the president and secretary of the Maritime Exchange and to the shipping firms of the city for the facilities received and assistance in carrying on the work of the office.

The following table presents in detail the work done during the past year:

1889.													Total for fiscal year 1888-89.
	July	Aug.	Septem- ber.	Octo- ber.	Novem- ber.	Decem- ber.	Janu- ary.	Febru- ary.	March.	April.	May.	June.	
<b>Reports forwarded:</b>													
Trade-wind limits.....	6	12	2	7	10	53	64	20	18	6	22	16	232
Ice.....	115	106	80	155	126	105	98	50	81	175	31	42	1,066
Wrecks.....	5	36	14	16	16	8	6	8	15	14	34	86	1,291
Fog.....	7	13	3	9	3	2	2	2	8	14	13	6	185
Buoys adrift.....	4	9	3	15	13	4	9	8	7	11	7	2	83
General information.....	13	13	3	5	3	4	1	2	2	3	1	2	62
Whales.....	3	3	3	5	3	4	1	1	2	2	3	13	13
Meteorological journals.....	31	71	41	58	33	41	52	51	43	36	57	45	550
Greenwich noon reports.....	14	29	21	21	32	46	72	33	28	18	71	42	198
Data for Mascart Cablegram.....	4	14	9	9	3	3	1	1	1	1	1	17	199
Storms.....	2	7	2	3	3	3	1	1	1	2	1	1	10
Unusual phenomena.....	11	5	1	4	13	8	8	13	7	6	23	4	97
Use of oil in storms.....													
Currents.....													
<b>Articles distributed.</b>													
Pilot Charts.....	504	462	400	685	102	427	558	471	401	450	389	294	5,263
Supplements.....	765	988	818	928	809	641	1,019	1,196	859	944	965	724	10,676
Notices to Mariners.....	17,576	16,336	15,249	16,064	17,073	17,709	15,596	11,258	19,171	24,503	30,853	23,229	224,567
Light Lists.....	64	73	46	35	48	111	106	87	92	40	84	72	848
Buoy books.....	200	235	306	142	98	311	198	255	140	262	353	104	2,584
Meteorological charts.....	12	12	12	12	24	4	4	4	4	6	6	16	36
Meteorological journals.....	5	5	5	5	5	5	5	5	5	5	5	16	16
Hydrographic Office Charts.....	20	14	14	14	14	14	14	14	14	14	14	1	1
Signal Service Weather Reviews.....	78	77	57	95	67	137	63	50	46	107	98	70	945
Miscellaneous publications.....	11	2	35	11	19	91	79	79	1	3	1	1	253
Greenwich noon reports.....	12	15	14	37	31	113	114	90	113	103	71	83	798
Nautical Monograph, No. 5.....	12	15	14	37	31	113	114	90	113	103	71	83	798
<b>Work done:</b>													
Vessels visited.....	161	183	150	179	124	118	166	160	154	189	213	150	1,956
Information furnished.....	1,775	2,128	1,948	2,200	1,756	1,726	2,290	2,032	2,063	2,444	2,617	2,147	23,146
Barometers compared.....	52	89	91	189	72	113	149	145	153	161	156	123	1,496
Thermometers compared.....	5	5	5	5	5	5	5	5	5	5	5	5	1,199
Office charts corrected.....	95	95	56	205	81	143	95	70	220	127	111	113	1,411
Vessels' charts corrected.....	44	30	41	100	42	11	44	39	58	47	76	40	572
Office light lists corrected.....	76	50	50	73	73	109	108	75	25	212	110	70	746
Vessels' light lists corrected.....	224	391	201	63	119	172	186	64	277	212	205	98	2,282
Buoy books corrected.....													

Respectfully submitted.

The HYDROGRAPHER.

W. P. CONWAY, Lieutenant U. S. Navy, in charge.

BRANCH HYDROGRAPHIC OFFICE,  
BOARD OF TRADE, 54 EXCHANGE PLACE,  
*Baltimore, Md., July 9, 1889*

SIR: I respectfully submit the following report of the work of this office for the year ending June 30, 1889:

The routine has been carried on regularly and the table below shows the details. The various publications of the Hydrographic Office are not only distributed to ships directly, but a number of copies are left in the offices of the chart agents, ship-brokers, and steam-ship agents in the city, and it is safe to assert that no vessel leaves port whose captain has not had within his reach the latest information of interest to mariners. The number of ship-masters and others calling at the office for information has increased during the year, and while it is hardly practicable to keep a record of each item of information given to individuals, it can be said that the information given has covered the range of subjects of most interest to ship-masters, and in every case great appreciation has been expressed for the help given and awakened interest shown in the practical working of this Bureau of the Government that comes in direct contact with merchant seamen.

The efforts of the Hydrographic Office to make plain to seamen the laws of West India hurricanes by storm cards on the Pilot Charts and other graphic data have met with great favor, and the plain, explicit directions for handling vessels in the vicinity of these storms have commended themselves to practical ship-masters and made the Pilot Chart especially valuable to West India traders and our coasting vessels. The wisdom of adopting the 10-point rule for locating the bearing of the center of these storms has been insisted on, in discussing the subject with captains, and, in this connection, the diagrams on the Pilot Chart have been very convincing to any who have been disposed to rely too much on the old rule.

A good deal of time has been given to discussing with captains the programme of the "International Marine Conference," and while changes in many respects in the present rules of the road at sea are thought necessary, all unite in saying that the adoption of a code of fog-signals for vessels under way to indicate their approximate course is the most important item to be considered by the Conference.

Much work has been done in correcting light lists and buoy books as to have these aids to navigation correct to date of issue, and it has been the endeavor of this office to impress on captains of vessels the fact that by filing the monthly Hydrographic Office Notices to Mariners and the Coast Survey Notices, which the branch offices now distribute, they can always have at hand a complete record of changes in aids to navigation as well as the dangers reported from time to time and, with very little trouble, can keep their own charts corrected for the most important changes. In correcting ships' charts brought to the office I have been struck by the great number of charts so worn and much out of date as to be almost useless, in cases dangerous, for purposes of navigation, and in view of the great interests involved and the very moderate price of government charts, it would seem to be a wise measure on the part of the marine underwriters to require that the latest and most reliable charts be considered part of the equipment of every sea-going vessel.

A chart of the West Indies, Caribbean Sea, and Gulf of Mexico, two sheets, with Havana in the eastern half, would find ready sale among coasting vessels which now buy English charts of those waters on a more popular scale and plan than our present charts. It is suggested

that Hydrographic Office charts Nos. 1070 and 1071 would be much improved in usefulness and more acceptable to mariners by including the Gulf of Mexico, and by having shown on them the trade-wind limits, ice limits, general direction of ocean currents, and as many soundings near shore as can be shown without confusion. The average merchant captain prefers to have his chart show the most needed information rather than consult books of sailing directions.

The time-ball has worked very well, few failures to drop being recorded. I renew my recommendation of last year with regard to a change of location of the time-ball to a place more visible from the harbor and lower wharves.

The last annual report of the Board of Trade of Baltimore has the following:

BRANCH HYDROGRAPHIC OFFICE.

Lieut. S. L. Graham, having been assigned to duty elsewhere, was succeeded in the charge of this office by Lieut. James P. Parker. The efficiency of the office has been fully maintained, and the information disseminated continues to be of great benefit to all maritime interests. Our committee-room is still occupied free of charge, the appropriations for this office not being sufficient to enable them to rent an office.

The thanks of this office are due to the officers of the Board of Trade, and of the Merchant's Exchange, to the shipping firms of the city, and the newspapers, for uniform courtesy and assistance in carrying on the work.

The following is a tabulated statement of the work accomplished:

	1888.						1889.						Total.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
Vessels visited	161	206	143	155	154	198	197	134	149	110	115	164	1,886
Barometers compared	25	19	19	14	17	13	33	36	37	32	11	32	282
Charts corrected for vessels		2		11	3	2	6	1	3	1			31
Light lists corrected	122		25	20			15	9	2		198	83	574
Buoy books corrected			57	238	126	187			106				714
Pilot Charts distributed	225	242	240	222	191	236	248	276	241	160	160	162	2,603
Weekly supplements distributed	586	693	577	538	560	560	795	832	674	770	589	628	7,802
Notices to Mariners distributed	2,601	6,298	3,480	6,009	4,650	8,006	5,810	5,140	6,847	7,640	5,038	7,662	69,189
Light lists distributed	41	49	22	18	10	21	15	11	3	4	79	22	295
Buoy books distributed	12	95	60	110	160	92	101	47	120	94	65	127	1,083
Pamphlets on West India hurricanes	118	81	45	17		1			2	4		11	282
Hydrographic Office charts distributed													3
Gnomonic charts distributed	6			1	3		1		2	4		1	18
Variation charts distributed	1			2	1								4
Pamphlets on "Use of oil distributed				42		15	3	2					62
Pamphlets on "Life saving distributed						57	11	16	14	2			100
Chronometers compared	35	41	32	36	27	43	36	34	45	36	36	22	423
Reports forwarded:													
Storm reports	1	3	8	6	10	15	8	6	3	7	2	2	71
Ice reports	4	3	1								1	5	17
Fog reports	20	12	9	7	1	3	1	2	1	11	13	7	87
Wreck reports	12	10	2	7	5	7	10	4	2	8	1	6	74
Buoys adrift	2			2		2						1	7
Use of oil at sea													1
Water spouts													1
Whales		3		1		1				2			7
Greenwich noon reports	24	31	27	25	16	28	28	14	14	17	19	24	267
Trade-wind limits	3		1			1	3				1	3	12

Respectfully submitted.

JAMES P. PARKER,  
Lieut. U. S. Navy, in charge.

The HYDROGRAPHER.

BRANCH HYDROGRAPHIC OFFICE,  
*Norfolk, Va., July 1, 1889.*

SIR: I beg to submit to you the following report of the work done by this office for the year ending June 30, 1889:

By the Department's order I arrived here in the latter part of February, and on March 1, 1889, opened this branch office, having been assigned a portion of one of the rooms in the United States custom house.

The first half of the month of March was mostly expended in getting acquainted with various commercial organizations and with persons engaged in maritime pursuits.

Commodore George Brown, U. S. Navy, courteously furnished me with a letter of introduction to General V. D. Groner, who devoted the better portion of a day to accompany me about the city and introducing me to the leading business men of Norfolk.

The two principal commercial bodies of this city are the Chamber of Commerce and the Cotton Exchange. The leading ship-brokers, underwriters, etc., members of these organizations, expressed great satisfaction that the Chief of the Bureau of Navigation had decided to establish a branch of the Hydrographic Office in this city, and assured me that they would give me their hearty co-operation, which they certainly have done.

Under such favorable auspices the office was in thorough working order by the 15th of March.

On March 13 I engaged the services of Mr. Guy Hall as messenger and clerk, but he became dissatisfied with his position, I gave him his discharge, and on March 28 employed Mr. T. E. Elliott in the same capacity.

I take this occasion to state that Mr. Elliott has given great satisfaction, and that he has, by strict attention to his duty, become quite efficient in the routine work of the office.

The amount of work done by the office has steadily increased, as will be seen from the number of articles distributed each month.

The months of March and April were exceptionally stormy, and the Atlantic coast was strewn with wrecks. Many vessels were also lost in Chesapeake Bay. This office was able to render much valuable assistance to wrecked vessels on Virginia Beach by sending and forwarding telegrams, letters, etc.

By your permission I have written a series of articles for the Journal of Commerce, the commercial paper of this city, and in these articles gave a general explanation of the work done by the branch hydrographic offices. I received two hundred and fifty copies of each issue containing these articles, and these I have distributed to captains of vessels and to others interested in maritime affairs.

One effect of these articles has been to produce numerous applications for information upon subjects of a maritime nature.

I have considered the newspapers so distributed as being "general information."

I would call your attention to the importance of Norfolk as a center for the collection and distribution of hydrographic information. The port of Newport News and the pier at Lambert's Point have become the coaling stations of our Atlantic coast. If the schooners and smaller coasting vessels ascending the James River or going through the canals be taken into account there is more tonnage passing through Hampton Roads than that which ascends to Baltimore.

I forward the latest received information immediately to Newport

News and to Lambert's Point, in care of gentlemen who carefully attend to its dissemination among the vessels.

The president and the secretary of the Chamber of Commerce, representing the business men of Norfolk, desire me to express to you their satisfaction with the way in which the office has furnished its various aids to navigation.

In conclusion I would suggest that, if practicable, there be issued, once a month, to this office and to that at Baltimore, a number of printed lists of the dangers and changes occurring in the Albemarle and Pamlico Sounds. This need not be an expensive publication, but something after the style of the supplements to the Pilot Charts, and it would be of great use to the smaller craft running between Baltimore, Norfolk, and New Berne.

The following is a tabulated statement of the work accomplished:

	1889.				Total
	March.	April.	May.	June.	
Storm reports .....		1	10		11
Fog reports .....		1			1
Water spouts .....				1	1
Wreck reports .....	2	16	5	3	26
Buoys adrift .....		4	4	2	10
Vessels visited .....	17	29	43	43	132
Barometers corrected .....	1		1		2
General information .....	1	250	1,000	1,250	2,501
Information to individuals .....	125	251	394	563	1,333
Light Lists distributed .....	1		18	24	43
Day Marks distributed .....	3	12	29	26	70
Day Marks corrected .....				3	3
Charts corrected .....		16	60	44	120
Pilot Charts distributed .....	79	167	191	139	576
Supplements distributed .....	80	166	202	384	832
Notices to Mariners distributed .....	178	404	315	897	1,854
Coast Survey Mariners distributed .....				14	14
Weather Reviews distributed .....				11	11
Hurricane pamphlets distributed .....	10	13	57	6	95
Use of Oil reports forwarded .....		2			2
Whales sighted, reports forwarded .....		1	1		2
Light vessels adrift .....	5	2	1		8
Cyclone charts distributed .....			8	1	9
Buoy extinguished report .....			1		1

Respectfully submitted.

HENRY H. BARROLL,  
*Lieutenant, U. S. Navy, in Charge.*

The HYDROGRAPHER.



BRANCH HYDROGRAPHIC OFFICE,  
*Maritime Association, New Orleans, La., July 1, 1889.*

SIR: In obedience to your instructions I have the honor to submit the report of the work of this office during the fiscal year ending June 30, 1889.

Between July 1 and September 24, 1888, the office was in charge the assistant. I assumed charge on September 24, 1888.

Very little can be done in the summer in New Orleans, as very few vessels visit it from the 1st of June to the 1st of October. After October 1 the trade becomes livelier, but the season this year was short and fewer vessels came here than usual.

The work of this office was retarded at the beginning of my term duty by reason of the standard barometer not being in repair; consequently no vessels were visited during October.

Another drawback is that of late many vessels have gone to Southport, above the city, where they are inaccessible.

The time-ball has not been in working order since March 1, when the second of the two halliards broke. The time-signals have often been interfered with by operators breaking in during the three minutes before Washington noon, set apart for the exclusive use of the wires of the Observatory.

The co-operation of the Signal Service observers at Key West, Ft. Pensacola, Fla., Mobile, Ala., and Galveston, Tex., has not been followed by results of any consequence as yet. They afford, however, opportunities for the distribution of the material issued by the office and no doubt the results will show later.

On all sides expressions of commendation and appreciation of the Pilot Charts come from those interested. Captains of vessels value them highly, and with their wider circulation more and more observers volunteer their services.

The failure of Congress to appropriate a sufficient amount to continue properly this important work has been a source of great regret to me, as the reduction in the number of Pilot Charts issued has compelled me to stop sending them to many offices and institutions where they were greatly appreciated.

In the early part of November, in accordance with the request of the Chamber of Commerce, I delivered a lecture on the subject of cyclones for which I received a vote of thanks of that body.

The thanks of the office are due to the Maritime Association for their courtesy and the use of their rooms, and to the press of the city and the various shipping firms and agents, who have forwarded in every possible way the work of the office.

The following is a statement of the work done :

	1888.						1889.						Total.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
Vessels visited.....	16	17	29	...	53	45	37	35	39	25	23	21	340
Barometers compared or adjusted.....	15	13	28	...	63	59	48	50	45	36	29	27	413
Information to individuals.....	63	68	85	62	48	64	63	58	73	61	62	81	788
Chronometer comparison given.....	3	...	10	1	2	6	2	4	9	3	...	4	44
Pilot Charts issued.....	85	89	100	107	110	145	150	180	136	122	88	116	1,428
Weekly Supplements to Pilot Chart.....	156	150	188	103	61	142	98	241	433	343	490	572	2,983
Day Marks, United States, issued.....	...	1	2	12	109	64	50	458	194	68	58	29	1,045
Light Lists, United States, issued.....	...	2	8	8	37	7	14	30	16	63	63	23	198
Extract Notices to Mariners.....	175	93	115	44	472	1,725	2,271	6,149	10,396	5,320	5,959	14,186	46,905
West Indian Hurricane Charts.....	...	1	2	...	...	...	...	...	...	...	9	5	14
Pamphlets, Use of Oil.....	1	2	6	...	...	...	...	...	...	...	2	...	11
Wrecks (including wreckage).....	1	1	1	2	...	7	7	3	4	4	5	10	45
Storms at sea.....	...	5	6	4	2	6	11	2	15	5	12	4	72
Buoys adrift.....	...	...	...	...	...	...	...	...	...	2	...	1	3
Water-spouts.....	1	1	...	...	...	...	2	1	...	...	...	...	5
Trade-wind limits.....	...	...	1	...	...	...	...	...	...	...	...	...	1
Current report.....	...	...	...	...	...	...	...	...	...	...	...	...	1
Meteorological Form 103 distributed.....	...	...	5	7	31	32	15	103	11	11	2	10	234
Meteorological Form 103 forwarded.....	11	6	7	16	14	41	30	32	48	27	30	30	292
Extract log American steam-ship <i>Knickerbocker</i> .....	...	...	1	...	...	...	1	...	...	...	...	...	2
Extract log British steam-ship <i>Jamaican</i> .....	...	...	1	...	...	...	...	...	...	...	...	...	1
Extract log British steam-ship <i>Ardabalm</i> .....	...	...	1	...	...	...	...	...	...	...	...	...	1
Storm journal American steam-ship <i>Knickerbocker</i> .....	...	...	...	...	...	...	1	...	...	...	...	...	1
St. Elmo's Fire.....	...	...	...	...	...	1	...	...	...	...	...	...	1
Supplement to August Chart.....	...	79	14	...	...	...	...	...	...	...	...	...	93
Supplement to September Chart.....	...	...	2	...	1	...	...	...	...	...	...	...	3
Supplement to February Chart.....	...	...	...	...	...	...	67	25	20	4	...	1	117
Meteorological form British steam-ship <i>Dryden</i> .....	...	...	...	...	1	...	...	...	...	...	...	...	1
Pamphlets, West Indian Hurricanes.....	1	...	...	...	...	...	...	...	...	...	...	...	1
Form 105.....	...	...	...	...	...	...	...	...	...	...	...	...	33
Monthly Weather Reviews.....	9	6	6	17	14	3	40	7	2	30	12	11	157
Fog report.....	...	...	1	1	...	...	...	...	...	3	3	4	12
Nautical Monographs, No. 5.....	...	...	...	1	...	...	4	...	...	...	...	...	4
Ice report.....	...	...	...	...	...	...	...	...	...	...	3	1	4
Whale report.....	...	...	...	...	...	...	...	...	...	...	...	2	2
Unusual phenomena.....	...	...	...	...	...	...	...	...	...	...	...	1	1

Respectfully submitted.

JOHN S. WATTERS,  
*Ensign, U. S. Navy, in charge.*

The HYDROGRAPHER.

BRANCH HYDROGRAPHIC OFFICE,  
*Merchants' Exchange, San Francisco, Cal., July 5, 1889.*

SIR: I have the honor to submit the following report of the work of the San Francisco branch of the United States Hydrographic Office for the fiscal year ending June 30, 1889:

The regular routine work of the office, involving the correction of charts, light lists, and sailing directions, the distribution of all kinds of nautical information, the comparing and correcting of ships' barometers, the rating of chronometers, the collecting and forwarding of reports, etc., has been carefully kept up.

Time signals have been received daily from the U. S. Naval Observe-

tory at Mare Island; the time-ball on Telegraph Hill, under the management of this office, has been dropped daily and continues to work satisfactorily. Special bulletins, containing accounts of all dangers and aids to navigation along the Pacific coast, notes on revolving storms, and the use of oil at sea to prevent the breaking of the waves, lists of marine disasters and accidents, and other information of use and interest to mariners have been issued monthly and distributed all along the coast.

In addition to this, it has been our constant endeavor to improve the standing of the office among the shipping and commercial people of the Pacific coast and to extend its benefits in every direction.

Persistent efforts have also been made to spread abroad among those who are or should be interested in its development and success a more perfect knowledge of the work and aims of the Hydrographic Office.

A great deal of work has been done having for its object the early publication of a monthly pilot chart of the North and South Pacific Oceans, similar in its general plan to that of the North Atlantic Ocean already published by the office, and covering the routes to Australia and China. The benefits arising from the regular publication of such a chart would be very great.

An attempt has been made to interest missionaries and others residing in the islands of the Pacific in the work of the office and to secure their services as observers.

The want of accurate charts and sailing directions for the waters of British Columbia and Alaska is severely felt. The number of vessels annually doing business in Alaskan waters in connection with salmon fisheries and canneries is steadily and rapidly increasing and demand for reliable charts are constant. The need of making and publishing new and accurate surveys in these localities is imperative. Constant inquiries are also made for coast and harbor charts of Australia, China, Japan, and the islands of the Pacific.

The general sailing charts and the charts of the coasts of Mexico and Central America that have been published and issued by the Hydrographic Office within the last few years are universally commended; the paper, however, upon which these charts are printed has not been found to be as durable as could be desired.

The constantly increasing commercial importance of Port Townsend, Wash., and of San Pedro, Cal., and the steady increase in the number of vessels annually visiting those ports, render strongly advisable the establishment there of branch offices.

Too much stress can not be laid upon the entire inadequacy of the quarters allotted to this office. We are at present crowded into a small, railled-off corner of the reading-room of the merchants' exchange, containing a floor space of about 12 by 18 feet, and into this are crowded the chart and book shelves, the chart table, three desks, a typewriter stand, a stand for the letter-copying press, the case for chronometer and the batteries and fixtures appertaining to the time-ball. Added to the limited amount of space the fact that the noise and the dust in the room are frequently very great and very oppressive, and it will be seen that no fine or accurate work of any kind can be done here. The renting of suitable quarters for this office is most earnestly recommended.

The heartiest thanks of this office are due to the chamber of commerce, the merchants' exchange, the various shipping and commercial firms, and to the press of this city for their uniform and hearty cooperation and support.

Following is a tabular statement of the work of the office for the year ending June 30, 1889:

	1888.						1889.						Total.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
Storm reports forwarded	4		3	4	4	2	2	2	1	2	2	5	31
Trade-limit reports forwarded	13	39	53	23	32	40	14	10	49	19	26	23	250
Abstracts of logs forwarded	4	11	18	1	1			1	2			2	40
Wrecks reported (including logs)			1					3	1				5
Earthquake reports forwarded					1						1		2
Buoys adrift		1				3	1	4	2			2	13
General information given	191	201	175	150	250	180	192	179	186	200	150	250	2,304
Information furnished to individuals	256	331	298	300	633	1,272	1,415	1,615	1,815	1,620	1,302	865	11,741
Vessels visited	36	35	71	40	36	149	161	118	124	90	103	83	1,055
Barometers compared or adjusted		14	36	27	16	25	18	13	15	19	12	14	209
Charts corrected	6	3	17	61	48	24	34	42	30	70	20	10	365
North Atlantic Pilot Charts distributed.	13	13	16	16	13	18	22	16	15	17	20	16	195
Notices to Mariners distributed	732	1,676	967	411	383	3,491	1,069	2,769	2,853	1,674	3,049	2,114	21,788
Light Lists distributed	59	77	70	43	19	14			2	5	15	16	320
Day-marks distributed	3	6	3	4		3	9	82	60	63	31	30	294
Hydrographic Office Charts distributed.				8	20	12	16	3	10	31	16		100
Submarine Cable Charts distributed	3	5	10	1	1			2		1	1		24
Pamphlets on use of oil distributed													2
Special Bulletins distributed	400	400	400	400	400	400	400	500	500	500	500	500	5,300
Monthly Weather Reports distributed	6	4	5	7	3	2	8	3	7	5	5	5	60
Instructions in case of shipwreck	6					180	150	120	50				500
Bottle papers distributed					20	90	50						160
Meteorological journals issued				2	4		2						8
Meteorological journals returned filled		2	6	5	3	7	1	1				2	27
Meteorological journals returned unfilled							1						1
Greenwich noon observations issued	12	12	11	8	2	5	3	6	12	15	7	3	96
Greenwich noon observations forwarded	10	21	4	6	7	11	9	10	6	17	10	12	150
Fog reports forwarded			3		1	1							5
Water-spout reports forwarded						1	1						2
Current reports forwarded								2			2		4
Electrical storm report forwarded									2				2
Intelligence reports forwarded									3		9	1	13
Reports on dangers in Pacific forwarded									1				2
Errors in charts reported	1						2	2		1			6
Light-House Inspectors' Notices forwarded									4	3	3	2	12
Letters from steam-ship companies forwarded									1	3	1		5
Vessels' tracks forwarded							1	1	1	1		4	8
Hydrographic Office Catalogues distributed					1			1	1				3
Reports of Hydrographer distributed								3					3
Chronometers rated	3	2	3	3	4	7	11	1	7	2		1	54
Reports on use of oil forwarded									1			1	5

Respectfully submitted.

H. P. McINTOSH,  
Lieutenant U. S. Navy, in charge.

The HYDROGRAPHER.

**BRANCH HYDROGRAPHIC OFFICE,  
Portland, Oregon, June 30, 1889.**

**SIR:** I have the honor to submit the following report of the work of this office for the fiscal year ending June 30, 1889.

In obedience to orders from the Navy Department this office was opened for work upon receipt of the outfit of books and charts on March 25.

Through the courtesy of the Portland Board of Trade space for the office was assigned in the room of the Merchants' Exchange Association, No. 31 First street.

This location is the most desirable in the city, being centrally located with reference to the shipping offices.

Considerable embarrassment has been felt on account of lack of proper office furniture, entailing much trouble and loss of time in handling charts and much difficulty in securing their proper preservation. As far as the instruments on hand have permitted, the office work has been kept up to date.

All deep-sea vessels and most of the coasting vessels arriving in the port have been visited. All vessels arriving in the ports of Oregon and Washington have been notified of the existence and purpose of the office and have been furnished with the current Notices to Mariners covering their proposed route and with such other nautical information in possession of the office as might prove of interest to them.

There have been many inquiries as to when a pilot chart of the Pacific would be published. This publication would be of the greatest benefit to ship-masters of this coast and would greatly facilitate the collection of marine data by the hydrographic offices by placing before ship-masters the direct result of their observations and reports.

The special bulletin issued from the San Francisco office is highly appreciated by all who are connected with the shipping interest.

I would respectfully recommend that the officer in charge of this office be ordered to visit the principal Puget Sound ports several times each year in order to extend the knowledge of the existence and purpose of the Hydrographic Office and to make arrangements to increase the opportunities for collecting useful marine information. A sub-station at Port Townsend, Wash., would prove very valuable by collecting many reports that are now unavoidably lost.

The establishment of a time signal in Portland would be highly appreciated by the whole business community. I respectfully recommend that it be done at the earliest practicable date.

It has been possible to keep the office work up to date only because this is the dull season for shipping. On the arrival of vessels to move the wheat crop, commencing in August, the services of a competent assistant will become an imperative necessity for the proper prosecution of the work and so there shall be no one disappointed who applies for information during office hours.

The thanks of the office are due to the officers of the Board of Trade and Merchants' Exchange Association, the press, and to various firms and members of the shipping community for the unvarying courtesy and kindness which have been shown in the prosecution of its work, and to Messrs. Watterman & Katz, shipping and commission agents, Port Townsend, Wash., for delivering and forwarding mail matter, and also to the Light-House office, thirteenth district, for much valuable assistance in establishing this office.

The following table shows in detail the work accomplished by this branch since its establishment March 25, 1889:

	1889.				Total.
	March.	April.	May.	June.	
<b>Articles distributed:</b>					
Pilot Charts .....	2	31	16	8	57
Supplement to same .....		2			2
Special Bulletins (San Francisco) .....		68	74	74	216
Notices to Mariners .....	249	998	1,230	1,114	3,591
Coast Survey Notices to Mariners .....				58	58
Light-Lists (United States) .....			57	23	80
Buoy Books, Twelfth and Thirteenth Districts .....			102	56	158
Hints on West India Hurricanes .....		1	5	7	13
Greenwich Noon Observation (sets) .....				4	4
General Sailing Charts .....				1	1
Report of the Hydrographer .....			10		10
List of United States Vessels .....				1	1
Signal Service Weather Review .....		6	12	8	26
Pamphlets on Use of Oil .....		1	5		6
<b>Reports forwarded:</b>					
Trade Winds .....	3	6	2	8	19
Wrecks .....			1		1
Fogs .....				1	1
Buoys adrift .....		1		2	3
Buoys missing .....			1		1
Meteoric storm .....		1			1
Currents .....				2	2
Discolored water .....				1	1
Abstract log British bark <i>Assage</i> .....				1	1
Abstract log British ship <i>Vandura</i> .....				1	1
Abstract log British ship <i>Borroedale</i> .....				1	1
Vessels' track .....	1				1
Report on Dragon Island .....				1	1
General information .....		1			1
<b>Work done:</b>					
Vessels visited .....	8	13	17	25	63
Information to individuals .....	58	342	287	130	817
Barometers compared .....				5	5
Letters to captains .....		45	88	59	192
Charts corrected .....		3			3
Light-lists corrected .....		174	73	78	325
Day-marks corrected .....			75	75	150
Sailing directions corrected .....		437	82	111	630

Respectfully submitted.

D. F. TERRELL,  
Ensign U. S. Navy, in charge.

The HYDROGRAPHER.

## REPORT OF SUPERINTENDENT OF NAVAL OBSERVATORY.

U. S. NAVAL OBSERVATORY,  
Washington, August 19, 1889.

SIR: I have the honor to submit, in compliance with the Bureau's order of the 6th instant (No. 1816 *b*) the report of the Naval Observatory for the fiscal year ending June 30, 1889.

The following changes in the personnel have occurred. **Detachments** Commander A. D. Brown, on October 30, 1888; Lieut. William P. Elliott, March 13, 1889; Lieut. L. C. Heilner, April 18; Lieut. A. G. Winterhalter, April 29; Ensign A. N. Mayer, April 19, 1889. **Assistant Astronomer** William C. Winlock resigned May 14, 1889. **Reported for duty:** Lieut. Hiero Taylor, November 27, 1888; Lieut. W. O. Sharrer December 20, 1888, and Ensign J. A. Hoogewerff, June 1, 1889.

## DIVISION OF WORK—OFFICERS IN CHARGE.

*Assistant to Superintendent.*—This office ceased to exist on the detachment of Commander Brown, and the duties formerly pertaining to it have, since December, been performed by Lieutenant Sharrer.

*Chronometers and time service.*—Lieut. Hiero Taylor.

*East transit instrument.*—Lieut. B. W. Hodges.

*Inspection of instruments.*—Ensign A. B. Clements.

*Magnetic instruments.*—Ensign C. C. Marsh.

*Great equatorial.*—Prof. Asaph Hall.

*Transit circle.*—Prof. J. R. Eastman.

*9.6-inch equatorial.*—Prof. Edgar Frisby.

*Library.*—Assistant Astronomer H. M. Paul.

*Instrument-maker.*—William F. Garduer.

*Clerk.*—Thomas Harrison.

The meteorological observations were made by the watchmen, Dennis Horigan, Nicholas Cahill, and William Henderson.

Prof. William Harkness is also attached to the Observatory for special duty as the member of the Transit of Venus Commission, having direct charge of the reductions and computations of the observations of 1874 and 1882. His report of the progress of the work is hereto appended marked Appendix B.

## THE GREAT EQUATORIAL.

(Professor Hall, in charge.)

This instrument has been employed in observing double stars and the satellites of Saturn. Attention was also given to the appearance of this planet, to the divisions of the ring, and to the shadows. As the satellite Iapetus had returned to nearly the same apparent position with respect to Saturn that it had in 1875, a new series of observations by the method of differences of right ascension and declination was made at the last opposition. These have been reduced and are nearly ready for discussion. The drawings of Saturn have been finished, and the notes on the appearance of the planet made since 1875 have been sent to the printer. These drawings and notes will appear as Appendix I to the volume for 1885.

Ensign H. S. Chase has been employed on the work of this instrument, in revising the reductions and in preparing the observations for publication.

Mr. George Anderson has had charge of the dome and the gas-engine.

The instrument is in good order.

#### THE TRANSIT CIRCLE.

(Professor Eastman, in charge.)

The transit circle has been employed on observations of the sun, moon, major and minor planets, and such stars as were necessary for clock and instrumental corrections. The observation of a small list of stars for the U. S. Coast and Geodetic Survey has also been undertaken.

The assistants on the work of this instrument have been Assistant Astronomer A. N. Skinner; Assistant Astronomer H. M. Paul, to November, 1888; Assistant Astronomer W. C. Winlock, to May 14, 1889; Computer William M. Brown; Computer A. S. Flint, since November 24, 1888.

From October 9, 1888, to June 30, 1889, 1,700 observations were made with the transit circle. Of this number 68 were of the sun, 50 of the moon, 93 of the major planets, 18 of the minor planets, and 5 of Comet *e* 1888. Clock signals were exchanged with Buchtel College Observatory, Akron, Ohio, on six nights in December and January to determine the longitude of that observatory.

The reduction of the observations which have been accumulated with this instrument has delayed observations on the zone of stars for the German Astronomical Society.

The transit circle work for 1885 is nearly ready to be copied for the printer, and the reductions for 1886 are now in hand.

But one of the two additional computers estimated for last year was authorized by Congress; he has not yet been appointed. The other is asked for in the estimates recently submitted. It is earnestly hoped that the services of both, so greatly needed, may be obtained.

#### THE 9.6-INCH EQUATORIAL.

(Professor Frisby, in charge.)

This instrument has been used for the identification of stars whenever necessary, and for the observation of small planets, comets, and occultations of stars by the moon. Three comets have been seen, and observed whenever possible; the observations have all been reduced and published in the *Astronomical Journal*. Two evenings in the week have been set apart for the accommodation of visitors. Permits for 1,665 visitors were issued.

The revision of Yarnall's Catalogue of Stars has been completed, and the work is nearly ready for distribution.

#### VARIABLE STARS.

For the last year and a half, Assistant Astronomer H. M. Paul has been engaged upon observations of a list of stars which have at various times been suspected of variability in brightness. One of the results of this work has been the discovery of a new variable in the constella-



tion *Antlia*, with a period of less than twelve hours, the short yet known. These observations will be published as soon as they be prepared for the printer.

#### CHRONOMETERS AND TIME SERVICE.

(Lieutenant Taylor, in charge.)

Lieutenant Taylor reported for duty November 27, 1888. En Mayer had been in charge up to that time and continued on duty until April 19, 1889, when he was detached.

The records show that during the year chronometers have been issued to eleven ships and one shore station. Chronometers have received from the same number of ships and shore stations. The chronometers received from the *Nipsic* and the *Vandalia* were so damaged that they have not been sent to the makers for repairs; other chronometers received were sent to the makers for necessary repairs. Box chronometers have been condemned for use as hack-chronometers. In October, 1888, fourteen chronometers were purchased. Five chronometers received from makers, cleaned and repaired, were under trial in the temperature-room December 23, 1888, and kept until March 6, 1889. The routine observed in the temperature room was the same as for the trial of 1887-88. The only mishap occurred two days before the end of the last term at 45°, when a leak from the ice-chamber was discovered. The chronometers were not in use. The trial in the chronometer-room has been completed. The results of this trial are given in Appendix A. The following table shows the number and disposition of the chronometers belonging to the Government at the end of the fiscal year:

Disposition of chronometers.	Box.	Hack.	Disposition of chronometers.	Box.	Hack.
Ready for issue .....	21	1	Repairing .....	32	
Issued .....	145	73	Loaned .....	3	
Trial .....	56		Total .....	363	
For repairs .....	25	136			

In addition there are: 7 chronometric watches, 6 hack-chronometric watches, 4 comparing watches.

No changes have been made in the routine of sending time signals. The signals are sent every day, Sundays and holidays, over the wires of the Western Union Telegraph Company, and are dropped at noon, 75th meridian, at Boston, Wood's Hole, New York, Philadelphia, Baltimore, Hampton Roads, and New Orleans. The Washington time-ball is worked by Government wire leading from the Observatory to the Navy building. With the single exception of Newport, the Observatory receives no reports from time-ball stations. Such reports, if it were possible to get them, would be valuable.

The signals have also been used to correct the clocks on the Observatory clock line. This service has been on the whole satisfactory. The serious trouble occurred in September, 1888, when the line was grounded in the new Government cable. The clocks up to the ground were corrected as usual, and beyond it by the use of a battery loaned by Western Union Telegraph Company, the signals being repeated from the company's office. The line is in good condition now, and the service is so satisfactory that there is a demand for its extension to all the Government buildings.

## EAST TRANSIT INSTRUMENT.

(Lieutenant Hodges, in charge.)

Lieutenant Heilner was in charge until April 18, and was succeeded by Lieutenant Hodges.

The instrument and all its connections are in good condition. The clocks have performed well. Observations have been taken to determine the corrections of the clocks whenever the weather permitted. Owing perhaps to the excessive amount of rainy weather the standard mean time clock has acquired a steady gaining rate of from two to three tenths of a second a day, having previously had a small losing rate.

## INSPECTION OF INSTRUMENTS.

(Ensign A. B. Clements, in charge.)

*Class A, sextants and octants.*—There were on hand at the time of the last annual report thirty-one sextants; eight have been received from Fauth & Co., having been repaired, and eight have been issued to ships in commission, leaving thirty-one now on hand. Of these, four are small hydrographic sextants, all ready for issue, and twenty-seven are of full size. Of the large sextants, twenty-two are in good condition for issue.

*Class B, thermometers.*—A Draper recording thermometer similar to the one examined last year was received from the agents in this city and placed under comparison. The results of this comparison only emphasized the conclusions of the previous trial. The recording apparatus works well, but the thermometer does not respond quickly to changes of temperature, and it can not be regarded as a reliable instrument for use in the service.

*Class C, spy-glasses.*—There have been received from various makers five spy-glasses, which were carefully examined, but they were not recommended for use in the service, and they have been returned to their owners.

*Class D, station pointers.*—No instruments of this class have been received for examination.

*Class E, clinometers.*—None received for examination.

*Class F, barometers.*—None received for examination.

*Class G, binocular glasses.*—Sixty-one binoculars have been examined. Of these twenty-seven were of the pattern referred to in the last annual report, and twenty were purchased; six were found defective and returned to makers, and one still awaits action. The remaining thirty-four, embracing many different constructions, were carefully examined, but, being found to be unsuited to the use of the service, were returned to the makers.

There are now on hand three; one the property of Levy, Dreyfus & Co., New York, one of the novel construction patented by Steinheil & Son, retained as a sample but unfit for issue, and one, a standard glass, in good condition.

## RECAPITULATION.

	On hand at last report.	Received.	Lent.	Returned to maker.	On hand.
Sextants .....	31	8	8		31
Thermometers .....	3	1		1	3
Spy glasses .....	1	5			1
Binocular glasses .....	3	61	21	60	3

## MAGNETIC INSTRUMENTS.

(Ensign Marsh, in charge.)

Lieut. Wm. P. Elliott was in charge until March 13, 1889, w  
was succeeded by Ensign C. C. Marsh, with Ensign J. A. Hoo  
as an assistant since June 1.

The self-recording magnetometer has been in operation continuo  
with the exception of about ten days, from January 1 (when all the r  
netographs were examined, cleaned, and, when necessary, readjust  
and an occasional stoppage of the clock, caused generally by the  
ance arrangement of the shades getting out of order. A new a  
knife-edge was fitted to the vertical-force magnetograph, and  
worked satisfactorily. As no change was made in the distance of  
mirror of the declination magnetograph from the recording cylinder  
value of last year was retained, viz:

*Declination.*—One centimeter of ordinate= $11'.29$  of arc.

The value of 1 millimeter of ordinate of the horizontal and vert  
force magnetographs has been determined, at intervals of about  
month, by the method of double deflections, the last, on June 12,  
ing—

Horizontal force,  $1^{\text{mm}}$  of ordinate=.00004687 c. g. s. units.

Vertical force,  $1^{\text{mm}}$  of ordinate=.00004302 c. g. s. units.

The temperature co-efficients of the H. F. and V. F. magnetogr  
have been determined by experiment once every three months, the  
June 13, giving—

Horizontal force, change of  $1^{\circ}$  C.=1.47 millimeters.

Vertical force, change of  $1^{\circ}$  C.=1.61 millimeters.

Observations of absolute declination have been taken twice a  
generally between 9 and 10 a. m. and 3 and 4 p. m., and from them  
value of the photographed base-lines of the declination magnetogr  
is deduced. The performance of the large declination magnet and  
odolite is good.

Observations have been made on Tuesday of each week for the de  
mination of the absolute horizontal intensity, and once each month  
have been made with the inertia cylinder attached to the magnet.  
magnetometer and magnets are in good order.

Observations of the magnetic inclination have been made, using tl  
needles in rotation, in the forenoon and afternoon of every Monday  
Friday. The dip circle and needles are in good condition.

Drawings of the composite curves, taken from the declination n  
netograms, are made for each month and negatives taken from them  
that prints can be made to send to other observatories and persons  
interested in terrestrial magnetism.

A full set of original photographs of the curves (of which there  
now two—made by using two papers on each cylinder) is sent to I  
each month.

This division has been furnished with copies of the magnetogr  
curves of declination from Toronto and Los Angeles. All distur  
days are selected, and a comparison of the disturbances is made  
tracings of the curves reduced to the same scale and placed over e  
other. These tracings are copied on blue or "nigrosine" paper,  
the prints sent to observatories and persons interested.

The results of the observations, besides being recorded in figu  
are, when practicable, put in the form of curves, so that all char  
and variations in the terrestrial magnetism can be readily seen  
compared with the occurrence of other natural phenomena.

Two seismoscopes and a seismograph have been purchased and set up within a few months, and are in good working order. They are examined from time to time, and the clocks connected with the seismoscopes are carefully rated. The seismoscopes are of the Rose-Polytechnic-Institute pattern; one is in the basement of the magnetograph building, with the seismograph, Lick-Observatory pattern, and the other is on a pier in a small building not in use at present.

#### THE INTERNATIONAL ASTROPHOTOGRAPHIC CONGRESS, ETC.

The preparation of the report, upon which Lieut. A. G. Winterhalter had been engaged up to the time of his detachment from the Observatory, was continued by him at the torpedo station in addition to his other duties.

The manuscript of Part I, comprising an account of the International Astrophotographic Congress, was sent to the Public Printer in September last; the remainder, containing the details of a visit to various European observatories under orders of the Department, has since been forwarded to the printer. Proof has been received and read since May last, and an early completion of the printing of the report may be expected.

#### THE LIBRARY.

(Assistant-Astronomer Paul, in charge.)

The library contains, according to the accession book, up to June 30, 12,226 volumes and 2,696 pamphlets. The accessions since the date of the last report have been 308 in number, 235 volumes and 73 pamphlets. Of these, 209 were received as exchanges and 99 by purchase.

The exchange list has been recently revised; and now contains 1,278 names, distributed as follows: Home institutions, 321; individuals, 244; foreign institutions, 244; individuals, 469. In the distribution of the observatory publications the general rule is to send the annual volumes to institutions and the separate reprints of the astronomical appendices to individuals.

The following publications are in the hands of the printer, and will soon be issued:

1. The annual volume for 1884.
2. 1884, Appendix I. A third edition of Yarnall's Catalogue of Stars, prepared by Professor Frisby.
3. 1885, Appendix I. International Astrophotographic Congress, by Lieut. A. G. Winterhalter.
4. 1885, Appendix II. Saturn and its Ring, by Professor Hall.

Assistant-Astronomer Paul has recently been placed in charge of the library in addition to other duties. The services of a librarian's assistant, for which estimates have been submitted, are very much needed.

Very respectfully,

R. L. PHYTHIAN,  
*Captain, U. S. Navy, Superintendent.*

The CHIEF OF THE BUREAU OF NAVIGATION.

APPENDIX A.—*Record of trial of repaired chronometers, 1888-'89.*

[In temperature room from December 23, 1888, to March 6, 1889; after that date in chronometer room.]

Time.	Dec. 23 to Dec. 30		Jan. 7 to Jan. 15		Jan. 17 to Jan. 24		Feb. 1 to Feb. 9		Feb. 12 to Feb. 20		Mar. 1 to Mar. 6		Mar. 13 to Mar. 20		Mar. 27 to Apr. 3											
	Dec. 23 to Dec. 30	Dec. 30 to Jan. 7	Jan. 7 to Jan. 15	Jan. 17 to Jan. 24	Jan. 24 to Jan. 31	Feb. 1 to Feb. 9	Feb. 9 to Feb. 12	Feb. 12 to Feb. 20	Feb. 20 to Feb. 27	Feb. 27 to Mar. 6	Mar. 6 to Mar. 13	Mar. 13 to Mar. 20	Mar. 20 to Mar. 27	Mar. 27 to Apr. 3	Apr. 3 to Apr. 10											
Temperature, Fahrenheit.	44°	93	55°	12	69°	91	85°	00	89°	83	84°	88	70°	11	54°	96	45°	70	57°	16	62°	16	61°	86	63°	13
Relative humidity, per cent.	70.7	68.7	70.7	66.4	61.9	61.0	63.4	64.0	53.0	64.0	62.0	64.0	62.0	64.0	62.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0
Repaired by—	No.	Maker.	No.	Maker.	No.	Maker.	No.	Maker.	No.	Maker.	No.	Maker.	No.	Maker.	No.	Maker.	No.	Maker.	No.	Maker.	No.	Maker.	No.	Maker.	No.	Maker.
1	Negus	1334	T. S. & J. D. Negus	+0.487	+1.463	+1.631	+0.047	-0.006	+0.833	+1.511	+1.121	+0.510	+1.578	+1.659	+1.740	+1.734										
2	do	1655	do	-0.941	-0.394	-0.349	-0.889	-1.359	-1.111	-0.703	-0.307	-0.040	-0.051	-0.091	-0.153	+0.151										
3	do	1454	do	-1.299	-0.037	-0.203	-0.761	-1.470	-0.576	-0.081	-0.271	-0.890	-0.433	-0.163	-0.617	+0.027										
4	do	1444	do	-1.977	+0.297	+0.024	-0.349	-1.140	-0.390	+0.291	-0.771	-0.500	-0.174	-0.469	-0.137	+0.016										
5	do	920	do	-1.191	-0.320	-0.774	-0.326	-0.399	-0.147	+0.086	+1.651	+1.040	+1.197	+1.516	+1.276	+1.683										
6	Bond	190	Wm. Bond & Son	+1.201	+1.963	+1.881	-0.647	-0.369	+0.086	+1.761	+1.657	+1.280	+1.897	+2.051	+2.026	+2.091										
7	do	2907	do	-0.941	-0.063	-0.040	+2.319	+1.994	+2.631	+2.047	+0.729	+0.510	+0.836	+1.290	+1.363	+1.770										
8	do	394	Wm. Bond & Son	+4.569	+3.856	+2.741	+1.290	+0.780	+1.386	+2.476	+3.407	+3.100	+3.361	+3.159	+3.026	+2.984										
9	do	446	do	-1.227	-0.892	-0.821	-0.710	-1.577	-0.647	+0.761	+0.586	+0.980	+0.504	+0.531	+0.490	+0.683										
10	Negus	1293	T. S. & J. D. Negus	-1.767	-0.690	-0.707	-1.480	-2.041	-1.676	+1.239	-1.807	-2.400	-1.199	-1.020	-0.939	-0.801										
11	do	1768	do	+1.201	+1.323	+1.310	+0.386	+0.066	+0.174	-0.293	-1.094	-0.900	+0.040	+0.191	+0.168	+0.199										
12	do	1272	do	-2.549	-0.677	-0.781	-1.466	-2.290	-1.617	-0.694	-1.946	-0.900	-1.874	-1.324	-1.721	-1.016										
13	Riles	1081	DeSire	-0.684	+0.677	+1.210	+0.323	+0.327	+0.317	+1.119	+0.556	+0.896	+0.836	+1.067	+1.097	+1.234										
14	Negus	1156	T. S. & J. D. Negus	-1.513	-0.190	+0.739	+0.540	+0.630	+0.281	+0.583	-0.446	+0.160	+0.464	+0.368	+0.849	+0.849										
15	do	725	do	-0.620	+0.394	+1.167	+1.193	+0.673	+1.210	+1.297	+0.663	+0.020	+0.219	+0.144	+0.068	+0.027										
16	do	1520	do	-1.636	-0.217	-0.300	-0.751	-2.704	-1.880	-0.613	-1.753	-1.140	-1.190	-0.389	-0.161	-0.287										
17	do	1697	do	-1.191	-0.490	-0.476	-0.507	-0.899	-0.700	-1.024	-1.260	-0.610	-0.444	-0.387	-0.766	+0.099										
18	do	1284	do	-1.908	-0.864	-0.476	-1.210	-1.970	-1.004	-0.696	-0.200	-0.490	-0.217	+0.134	+0.169	+0.341										
19	do	1266	do	-1.477	-0.430	+0.483	-0.317	-1.116	-0.381	-0.333	-0.593	-0.490	-0.341	+0.189	+0.189	+0.234										
20	Riles	2149	John Riles & Co	-1.156	+0.249	+0.660	-0.639	-1.256	-0.719	+0.281	-0.207	-0.900	+0.894	+0.944	+0.811	+1.234										
21	Bond	397	Edwards & Hunter	-0.917	+0.677	+0.381	+0.290	-0.613	+0.281	+0.701	-0.236	-0.004	+0.409	+0.409	+0.409	+0.409										
22	do	2597	Barnaud	-1.156	+0.437	+1.096	+0.861	-0.113	+0.406	+1.119	+0.057	-0.900	+0.900	+0.900	+0.900	+0.900										
23	Negus	1108	T. S. & J. D. Negus	-3.084	-1.323	-0.223	-0.603	-1.041	-0.594	+0.047	-0.850	-0.003	-0.003	-0.016	+0.007	+0.361										
24	do	718	do	-1.049	+0.213	+0.131	-1.281	-2.309	-0.611	+0.033	-0.271	-0.721	-0.840	-0.480	-0.587	-0.587										
25	do	160	do	-1.441	-0.180	+0.167	-0.587	-1.220	-0.680	+0.833	-0.271	-0.840	-0.480	-0.587	-0.587	-0.587										
26	do	1315	do	-2.120	-0.751	-0.440	-2.103	-2.970	-1.247	+0.851	-0.803	-0.271	-0.840	-0.480	-0.587	-0.587										
27	do	581	do	-2.876	-1.073	-0.281	-1.869	-2.077	-0.611	+0.033	-0.271	-0.840	-0.480	-0.587	-0.587	-0.587										
28	Bond	4913	Thomas Atkins	-1.234	+0.677	+0.317	+1.261	+0.280	-0.710	+1.024	+0.687	-0.000	-0.000	-0.000	-0.000	-0.000										
29	do	1064	W. B. Bond & Son	-0.814	-0.169	-0.047	-1.434	-1.837	-0.997	+1.489	+1.129	+1.440	+1.520	+1.444	+1.520	+1.444										
30	Negus	1264	T. S. & J. D. Negus	-1.768	-0.690	-0.707	-1.480	-2.041	-1.676	+1.239	-1.807	-2.400	-1.199	-1.020	-0.939	-0.801										

33	Negus	1470	T. S. & J. D. Negus	-1.788	-0.703	-0.961	-1.753	-2.449	-2.023	-1.291	-0.576	-1.742	-0.011	+0.210	+0.250	+0.397
34	do	1311	do	-1.049	+0.356	+0.310	-1.193	-1.849	-1.254	+0.119	-0.367	-1.000	+0.219	+0.409	+0.383	+0.484
35	do	1319	do	-3.750	-2.503	1.833	-2.840	-3.953	-3.706	-2.184	-2.540	-3.694	-2.440	-2.144	-2.306	-2.069
36	do	1282	do	-0.834	+1.249	+1.917	+0.833	-1.164	+0.031	+1.869	+0.830	-0.340	+1.804	+1.801	+1.811	+1.913
37	Bliss	464	Carter & Cole	-0.313	+0.966	+1.560	+0.933	+0.060	+0.139	+0.083	-0.093	-0.700	+0.576	+1.159	+1.400	+2.056
38	Negus	1244	T. S. & J. D. Negus	-2.192	-0.680	-0.190	-1.103	-2.113	-0.754	-0.274	-2.021	-3.290	-1.067	-1.091	-1.189	-0.801
39	Band	694	Do Silva	+0.309	+0.963	+0.324	-1.369	-2.470	-1.826	-0.346	-0.414	-0.740	+0.504	+0.801	+0.740	+0.913
40	do	3276	Charles Froelsham	-0.263	+1.070	+2.581	+1.004	+0.923	+1.460	+1.797	+1.239	-0.240	+1.540	+2.133	+2.347	+2.270
41	Negus	1750	T. S. & J. D. Negus	-1.044	+0.403	+1.417	+0.219	-0.756	-0.909	-0.596	-0.087	-1.140	+0.754	+0.990	+0.990	+1.127
42	do	775	do	-1.013	+0.249	+1.446	+0.611	-0.229	+0.317	+1.154	-0.129	-0.900	+0.469	+0.673	+0.954	+1.020
43	do	1050	do	-0.763	+0.891	+0.917	+0.576	-0.291	+0.781	+2.190	-2.371	+1.360	-0.389	-0.603	-0.117	+0.306
44	Bliss	2101	Crisp	-4.906	-1.394	-0.226	-1.251	-2.041	-1.540	-1.346	-2.664	-5.440	-0.389	-0.603	-0.117	+0.306
45	Negus	1267	T. S. & J. D. Negus	+2.441	+2.962	+4.095	+1.683	+0.984	+1.317	+2.297	+1.400	+1.260	+2.663	+2.706	+2.597	+2.620
46	do	1268	do	-3.703	+1.100	+1.361	-0.246	-1.363	-1.361	-1.917	-0.736	-3.240	-0.989	-0.377	-0.189	-0.016
47	do	1697	do	-3.703	+1.644	+0.476	-2.210	-3.541	-3.219	-2.917	-3.050	-4.760	-3.174	-2.964	-2.831	-2.637
48	do	919	do	-3.234	-1.287	-0.190	-1.317	-2.694	-2.290	-2.310	-4.164	-5.990	-3.853	-3.127	-3.046	-2.730
49	do	1223	do	-2.084	-1.073	-0.547	-1.067	-1.470	-0.381	+0.476	-0.914	-1.590	-0.746	-0.341	-0.267	.....



33	Negus.....	1470	T. S. & J. D. Negus.....	+0.253	-0.631	-1.137	-0.966	-1.023	-1.083	-1.067	-0.843	35.94	-0.000611	26.5023	35.0579
34	do.....	1311	do.....	+0.377	+0.209	+0.131	+0.323	-0.039	-0.313	-0.511	-0.433	64.30	-0.004510	3.8537	35.1257
35	do.....	1310	do.....	-2.211	-1.774	-1.851	-1.821	-1.869	-2.119	-2.053	-1.861	64.29	-0.004520	33.8179	35.2185
36	do.....	1282	do.....	+1.683	+1.816	+1.917	+1.944	+1.854	+1.630	+1.774	+1.817	48.01	-0.005140	36.3520	37.0335
37	Blae.....	464	Esher & Cole.....	+1.663	+2.244	+2.086	+2.133	+2.390	+2.009	+1.631	+1.746	70.95	-0.001450	34.2408	40.8714
38	Negus.....	1244	T. S. & J. D. Negus.....	-0.873	-0.613	-0.517	-0.234	-0.717	-0.341	-0.303	-0.103	71.75	-0.004040	38.5269	42.5994
39	Bond.....	694	De Silva Frodsham.....	+0.806	+0.923	+0.989	+0.980	-0.961	+0.544	+0.453	+0.924	60.68	-0.003260	42.0131	44.2653
40	do.....	3276	do.....	+2.377	+2.520	+2.609	+2.159	+2.089	+1.973	+1.846	+1.791	70.27	-0.005130	44.1522	48.0528
41	Negus.....	1750	T. S. & J. D. Negus.....	+1.050	+1.173	+1.246	+1.144	+1.319	+1.166	+1.010	+1.246	65.43	-0.002200	51.7023	53.6988
42	do.....	775	do.....	+0.806	+1.244	+1.417	+1.450	+1.354	+0.973	+0.953	+1.317	71.25	-0.005200	53.9735	55.4135
43	do.....	1050	do.....	+2.913	+2.740	+2.917	+2.587	+2.390	+2.110	+2.274	+1.996	61.03	-0.001770	58.3179	59.2433
44	Blae.....	2101	Crisp.....	+0.163	+0.546	+0.631	+0.730	+0.569	+0.259	+0.274	+0.486	72.49	-0.001150	81.5719	86.4741
45	Negus.....	1267	T. S. & J. D. Negus.....	+2.377	+2.419	+2.631	+2.623	+2.461	+2.739	+2.953	+3.067	67.36	-0.005570	82.9694	90.4041
46	do.....	1568	do.....	-0.301	+0.137	+0.381	+0.587	-0.334	+0.366	+0.131	+0.210	67.69	-0.003520	115.8976	92.9650
47	do.....	1697	do.....	-2.873	-2.684	-2.690	-2.091	-2.217	-2.170	-2.297	-2.590	70.29	-0.001710	141.2156	119.4621
48	do.....	919	do.....	-2.980	-2.613	-2.654	-2.949	-3.003	-2.491	-2.404	-2.576	73.41	-0.004310	141.2156	143.0058
49	do.....	1256	do.....	.....	.....	.....	.....	.....	.....	.....	.....	71.28	-0.003640	32.2036	.....



## APPENDIX B.

[Report of Professor William Harkness, of the Transit of Venus Commission.]

U. S. NAVAL OBSERVATORY,  
Washington, August 13, 1889.

SIR: I have the honor to submit the following report of the work done during the past year, under my supervision, for the Transit of Venus Commission:

Mr. A. S. Flint was the only assistant employed at the beginning of the year, and he left the service of the Commission on November 2, 1888, because of the exhaustion of the appropriation out of which his salary was paid. Since that date I have had no assistant.

The reduction of all the photographs taken with horizontal photoheliographs of about 40-feet focus, during the transit of Venus in December, 1882, is now complete, and if we put  $\pi$  for the solar parallax and  $\delta A$  and  $\delta D$ , respectively, for the corrections to the right ascension and declinations of Venus given by Hill's tables of that planet, it being assumed that Hansen's tables of the sun are correct, the results may be stated as follows:

From position-angles measured on 1,426 photographs:

$$\pi = 8.772'' \pm 0.0496'' \quad \delta A = +2.724'' \pm 0.0811'' \quad \delta D = +1.447'' \pm 0.1343''$$

From distances measured on 1,475 photographs:

$$\pi = 8.847'' \pm 0.0122'' \quad \delta A = +2.893'' \pm 0.0430'' \quad \delta D = +1.246'' \pm 0.0241''$$

Weighted mean from both position angles, and distances:

$$\pi = 8.842'' \pm 0.0188'' \quad \delta A = +2.856'' \pm 0.0390'' \quad \delta D = +1.252'' \pm 0.0237''$$

From the American Ephemeris for 1882, pp. 278 and 405, we have for the epoch 1882, December 6<sup>d</sup> 5<sup>h</sup> 00<sup>m</sup> Greenwich mean time,

Apparent right ascension of sun,	253° 12' 35.75"
Apparent declination of sun,	-22° 33' 17.53"
Apparent obliquity of ecliptic,	23° 27' 09.49"
Log. distance, sun to earth,	9.9934260
Log. distance, sun to Venus,	9.8576405
Inclination of orbit of Venus,	3° 23' 36.32"
Constant of aberration,	20.4451"

From the photographs, the observed position of Venus for the epoch in question, is—

$$\begin{aligned} \text{Apparent right ascension} &= 253^\circ 12' 35.75'' - 02' 44.424'' + 02.856'' \\ &= 253^\circ 09' 54.122'' + d\alpha \odot \pm 0.0380'' \\ \text{Apparent declination} &= -22^\circ 33' 17.53'' - 10' 21.371'' + 01.252'' \\ &= -22^\circ 43' 37.649'' + d\delta \odot \pm 0.0237'' \end{aligned}$$

And from these data we find:

Apparent geocentric longitude of sun,	254° 31' 39.976"
Apparent geocentric latitude of sun,	- 0° 00' 00.093"
Apparent geocentric longitude of Venus,	254° 30' 23.235" + $d\lambda \odot$
Apparent geocentric latitude of Venus,	- 0° 10' 33.255" + $d\beta \odot$
True geocentric longitude of sun,	254° 32' 00.729"
True geocentric latitude of sun,	- 0° 00' 00.093"
Heliocentric longitude of Venus,	74° 32' 24.611" + $d\lambda \odot$
Heliocentric latitude of Venus,	- 0° 03' 51.791" - $d\beta \odot$
Longitude of Venus in her orbit = $74^\circ 32' 17.74'' + d\lambda \odot + 0.030d\beta \odot$	
Longitude, $\Omega = 75^\circ 37' 33.91'' + d\lambda \odot - 16.868 d\beta \odot - 0.321d\lambda$	

With  $\pi = 8.842'' \pm 0.0118''$ , and 3963.296 miles for the equatorial radius of the earth, which is General A. R. Clarke's value, the mea-

distance from the earth to the sun is 92,455,000 miles, with a probable error of only 123,400 miles.

The measurements of the eighty-six photographs taken at New Haven have not yet been finally discussed, and the reduction of the photographs taken during the transit of December, 1874, has never been completed. Furthermore, the contact observations made by our own parties in 1874 and 1882, and by nearly a hundred volunteer observers in 1882, yet remain unreduced. I need the services of an assistant in order to accomplish all this work with the rapidity which is desirable.

Thus far Congress has provided only for the printing of the observations of the transit of 1874; and, as these observations are now nearly all in type, I would respectfully call attention to the urgent need of some provision for the printing of the observations made in 1882. If such provision is deferred until after the manuscript is ready for the printer, much unnecessary delay will result.

Hitherto it has been customary to endeavor to determine the solar parallax as if it were an independent constant, and the result is a mass of discordant values, all of which are more or less affected by constant errors, and none of which commands anything like universal assent. But, in truth, the solar parallax is not an independent constant. On the contrary, it is entangled with the lunar parallax, the constants of precession and nutation, the parallactic inequality of the moon, the lunar inequality of the earth, the masses of the earth and moon, the ratio of the solar and lunar tides, the constant of aberration, the velocity of light and the light equation, and, according to the most elementary mathematical principles, it should be determined simultaneously with all these quantities. No other method affords anything like so much promise of eliminating the ever-present constant errors, and for that reason I took it up last fall, intending to prosecute it as a private investigation during my leisure time. The results attained were presented to the Philosophical Society of Washington on October 13, 1888, but since then, in connection with my official work, the paper has been greatly expanded and will be ready for publication in a few days. In accordance with your wishes it is to form part of the annual volume of this Observatory.

Very respectfully,

WILLIAM HARKNESS,

*Professor of Mathematics, U. S. Navy,*

*Of Executive Committee of Transit of Venus Commission.*

Capt. R. L. PHYTHIAN, U. S. Navy,

*Superintendent of Naval Observatory,*

*President of Transit of Venus Commission.*

the end in view one of the surgeons has been appointed to direct the physical training of the cadets in the gymnasium and in their sports for the purpose of securing the best exercises for the general physical development of the cadets, and the best exercises for the individual cases, as well as to recommend the most suitable times for such exercises and to prescribe general rules of health to be observed at all times. It is thought that such scientific direction, supported by the constant supervision of the master of gymnastics, will secure the best results possible physically and, incidentally, in a moral way also.

Estimates are submitted for completing the purchase of furniture for the cadets' quarters. Twenty-five hundred dollars were appropriated at the last session of Congress, and \$7,500 more are required to reach what is most urgently needed.

The estimate for additional quarters for officers and instructors also renewed. There are now twenty married officers and professors without quarters, and these are always the juniors who are the least able to bear the additional expense. The consequence is that young officers whose services are much needed frequently decline duty at academy, because they can not afford to live here. It is proposed to build ten small houses, which would afford great relief.

The purchase of additional land adjoining the academy, provided for by act of Congress, has not yet been completed. It is now in the hands of the United States district court.

Considerable progress has been made in grading the property, which will be inclosed when the above purchase is completed. A new bridge across College creek is building under contract of last June. When finished the county road will pass entirely without the limits of the academy inclosure instead of through it, as the present road leads.

The usual summer routine was observed for the second class, but it accident to the practice-ship early in the cruise made it necessary to give the first and third classes their summer vacation in July and August, instead of in September.

When the practice-ship was repaired, the cadets were again embarked at Norfolk August 23, and cruised until September 28. The report of the commanding officer is sent herewith; also a statement of the appropriation for 1889.

In this report I desire to call the Bureau's attention to the following points relating to the course, which I think are vitally important to the future success of the institution:

The first is the length of the course, which should be four years, instead of six.

The second concerns the limits of the age of admission, which should be fifteen and eighteen, instead of fifteen and twenty.

(1) The course of study at the naval academy was increased from four to six years chiefly for the purpose of reducing the number of graduates and, consequently, the number of appointments to the navy. No instruction is given during the two years at sea.

This reason for a course of six years' duration no longer exists, since the number of appointments is now restricted by law to the aggregate number of appointments in the corps to which appointments are honorably discharged.

After the number of each class is determined, the number of appointments is usually by the number of appointments.

The return for the fine of \$12,000

Forty cadets presented themselves for final examination in May, and two in September.

Twenty-four were assigned to the Line, two to the Engineer Corps, and one to the Marine Corps. The remainder were honorably discharged.

The general conduct and spirit of the cadets has been excellent. I am gratified to report that no case of hazing has been observed either on board the practice-ship or subsequently at the academy.

The standard of scholarship has been maintained, and the changes in the course, referred to in the last annual report, have been most satisfactorily established.

The change in the method of teaching the modern languages, as recommended by Dr. Sauveur, has proved an entire success.

The course in the department of seamanship, naval tactics, and naval construction has been modified in an important manner by giving more time to modern ship construction and to the elements of naval architecture, while that portion of the old seamanship, which is fast becoming obsolete, has been studied principally for its historical interest.

In connection with this course the cadets of the first class with their instructors made a visit to the ship-building yards of Chester and Philadelphia in the month of April. This visit was of great interest and profit to the class, and it is hoped that it may be repeated this year, earlier in the course, and under even more favorable circumstances than last year.

The lack of a suitable text-book upon modern naval ship construction has been very much felt, and Constructor Gatewood has made considerable progress in preparing what is needed, together with such information upon naval architecture as is suited to the mathematical training of the cadets. A part of this is now in print. It is hoped that the course may be fully developed during the coming year and put in a permanent form.

Increased facilities for instruction in all the departments requiring them have been provided. The chemical laboratory has been enlarged. A convenient dynamo room has been completed and the driving engine and the dynamos have been set up.

Important and improved tools have been added to the work-shops of the department of steam engineering.

The boat-house provided for at the last session of Congress is nearly completed, and besides furnishing protection for the boats and steam-launches used by the cadets will furnish ample facilities for the instruction of the younger cadets in the rudiments of seamanship.

Many buildings in the grounds have received extensive repairs, including the building devoted to the department of seamanship, the building occupied by the department of steam engineering, the chapel, the cadets' new quarters, and likewise the old buildings formerly occupied as quarters.

The work of transforming the old chapel into a lecture hall has been completed.

Convenient dressing-rooms and wash-rooms have been constructed in connection with the gymnasium; some alterations have been made in the old gymnasium to make it more suitable, but it is earnestly hoped that Congress will appropriate the amount asked to rebuild it.

While the regular habits, wholesome food, and daily outdoor drills do develop young men of good physique, it is thought that considerable improvement may still be made by a more scientific supervision of their training in the gymnasium and in their athletic sports. With

this end in view one of the surgeons has been appointed to direct the physical training of the cadets in the gymnasium and in their sports for the purpose of securing the best exercises for the general physical development of the cadets, and the best exercises for the individual cases, as well as to recommend the most suitable times for such exercises and to prescribe general rules of health to be observed at all times. It is thought that such scientific direction, supported by the customary supervision of the master of gymnastics, will secure the best results possible physically and, incidentally, in a moral way also.

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The second concerns the limits of the age of admission, which should be fifteen and eighteen, instead of fifteen and twenty.

(1) The course of study at the naval academy was increased from four to six years chiefly for the purpose of reducing the number of graduates and, consequently, the number of appointments to the navy. No instruction is given during the two years at sea.

This reason for a course of six years' duration no longer exists, since the number of appointments is now restricted by law to the aggregate number of vacancies occurring each year in the corps to which appointments are made, the remainder being honorably discharged.

After being two years at sea, the members of each class have to return for final examination to the academy, usually by mail-steamer, thus making a broken cruise.

The return of each class to the academy for the final examination costs the country annually the estimated sum of \$12,000.

So far as those cadets who are honorably discharged are concerned, the two years' course at sea is without value to the government, though entailing considerable expense annually for their pay and rations, estimated at \$38,000, while the persons so discharged virtually waste two years during which they might acquire some place in civil life.

The final examination is unnecessary as a method of compelling those cadets who are appointed to the navy to keep up their studies of professional subjects. The naval service requires life-long and continuous study on the part of its officers, and their advancement towards the higher grades is guarded by examinations at every step. No other professional corps, and no other body of men in the world except the *literati* of China, is required to pass so many examinations. And the final examination of cadets is now similar in character to that which ensigns must pass before promotion. The country obtains at the end of the four years' course all the advantages which now accrue from that of six years.

The effect of the final examination upon the relative standing of the class is quite unimportant. At the examinations of the last two classes, which are the only ones that have entered since the law of 1882 and have completed the six years' course, but one cadet in each class succeeded in entering the service who would not have entered had he been appointed at the end of four years, instead of at the end of six years.

The average age of cadets at the end of the four years' course is about twenty-one years. Those who return to civil life at that time can enter upon any work which they may find, with minds and bodies trained to systematic and methodical reflection and labor. Nor can it be doubted that they acquire such knowledge of the naval profession and such interest in its duties as will suffice to secure their return to the navy in case of war. And it is my well-considered opinion that those who are selected for appointment to the Navy are fitted to begin their work in the navy at the end of the four years' course, and should be commissioned at that time in the lowest grade of the corps to which they may be appointed.

Changing the course to four years would increase the number of cadets at the academy by the number now serving at sea, or about sixty-four; but as the pay of naval cadets at sea is greater than that of cadets at the academy, the proper course would be, in this respect, more economical than the existing one. And while the number of cadets in any year would remain as at present, the number of graduates would be somewhat increased.

An increase in the number of graduates can not be objectionable. Twenty-eight members of the class which was graduated last June, after six years, were required to fill the vacancies which had occurred in the service during the previous year; but one of these vacancies was caused by retirement from age. As the average number of retirements from age will be seven for the next eight or ten years, it is probable that thirty-five graduates will be required annually to supply the waste in the service. When the Engineer and Marine Corps are reduced to the number fixed by law, a still larger number of graduates will be required. Now, the average number in the next three classes to complete the six years' course is but thirty-four, and this number will probably be reduced before graduation. It therefore appears *necessary* that the number of graduates should be increased.

It is accordingly recommended that the two classes now serving at sea be examined next May, and, together with the class then completing the four years' course, be commissioned as ensigns, the number to be

appointed from each class to be the same, and each equal to the number of vacancies which shall occur during the current fiscal year.

The necessary legislation to secure this change can be effected by modification of the act of 1882.

(2) The age of admission to the academy since last March has been between fifteen and twenty years.

I think this increase in age is a serious mistake. Probably the reason for this change was to secure young men of more mature years who would be capable of mastering the course of study.

A little consideration will show that, so far as passing the entering examination is concerned, the change will not improve matters.

The mental requirements for admission are very simple, and every boy in the country who has had ordinary advantages has passed the point in his education where he studies the subjects required at admission here. It does not follow, however, that he can pass the examination, because it is found that many boys "finish" arithmetic, geography, grammar, and spelling, and are woefully deficient in them all. Nor are they any better at twenty, or twenty-five even. In the natural course of things they would not go back to these rudiments. Candidates are constantly heard to say that they have not studied these things for several years; they have been studying more advanced mathematics, Latin, Greek, etc.

Again, if a young man of twenty has been able to pursue his studies up to the time he is appointed, he is far more advanced, at least in the branches he studies if not in actual acquirements, than is one who cannot pass the entering examination. If he has had such continuous schooling and is not thus advanced, then he is not and never would be in the service.

On the other hand, if a young man has reached the age of twenty and from lack of means or other cause has not been at school for three or four years, he is not as well prepared to enter as he was four years previous.

It is readily seen that increasing the age acts to the advantage of the boys who have had the best schooling; boys from those parts of the country where the schools are inferior or where the attendance is irregular will suffer by the increase in age, both at the examination for a mission and during the subsequent course, whereas it should be the reverse.

If the government took charge of the boy's education from the start all would be on an equality; the longer this supervision is deferred the more will the poor boy suffer and the rich one gain. The inevitable tendency of such a state of things is evident.

These two classes of young men—those who have had good advantages and those who have had none—may be widely separated in the mental acquirements at twenty years of age; they could not be associated in their subsequent education.

The entering examination could not be adjusted to the more favorably educated boys without injustice to those who had had little or no schooling for several years.

These two classes, however, are not very different in their acquirements at the age of fifteen or sixteen years. Most boys are able to attend school until that age, and all should be able to pass the required examination, and, as stated above, if they are not prepared at sixteen they probably would not be prepared at twenty.

Again, the records of this institution show that a larger percentage graduate of those who enter under fifteen than of those who enter over seventeen.

The explanation of this is to be found in the fact that the boy under fifteen who can pass the entering examination has improved his opportunities, and possesses a good degree of intelligence; whereas the boy over seventeen may be able to pass the examination, though possessed of much less natural ability and without having made such good use of his opportunities.

The consequence is that the younger boy has a better natural, and an equally good acquired preparation for the four years' course.

The average age of admission at present is between sixteen and seventeen, and nearer the latter age.

If the age of admission is to be advanced, then the requirements should also be advanced, and consequently the whole course further developed.

Considering that few enter below fifteen, and that the upper limit is reached by a much larger number, I think it advisable to fix the limits at fifteen and eighteen.

I consider it a serious objection to a plan that it requires the association of boys in the same class, and requires of them the same degree of proficiency when their ages differ so much as five years, which is the case under the operation of the present law.

The limit at present is quite wide enough, though it seldom exceeds three years.

The advanced age at which graduates will receive their first commission is a consideration which is of considerable importance, with the age of admission advanced to twenty years. Cadets when promoted will be from twenty-one to twenty-six years of age, whereas an officer at the age of twenty-six should have the experience and be capable of taking the responsibility belonging to a lieutenant.

Advancement in the lower grades is already too slow, and this law defers it two and a half years on the average, or in special cases three years later than is now possible.

Respectfully submitted.

W. T. SAMPSON,

*Captain, U. S. Navy, Superintendent.*

The CHIEF OF THE BUREAU OF NAVIGATION.

*Statement of the appropriation of the U. S. Naval Academy for the fiscal year ending June 30, 1889.*

Headings of the appropriations.	Amount appropriated.	Expended to June 30, 1889.	Unexpended balance.	Liabilities for supplies ordered prior to 30th June, 1889.	Balance in excess of liabilities.
Pay of professors and others.....	\$52, 119. 00	\$50, 785. 25	\$1, 333. 75	.....	\$1, 333. 75
Pay of watchmen, mechanics, etc. ....	44, 069. 95	44, 062. 45	7. 50	.....	7. 50
Pay of employes, steam-engineering department.....	7, 824. 50	7, 824. 32	18	.....	18
Repairs.....	21, 000. 00	16, 026. 36	4, 973. 64	\$4, 967. 56	6. 08
Heating and lighting.....	17, 000. 00	16, 951. 73	48. 27	28. 00	20. 27
Library.....	2, 000. 00	1, 597. 48	402. 52	401. 40	1. 12
Stationery.....	2, 000. 00	1, 906. 62	13. 38	13. 38	.....
Board of Visitors.....	1, 500. 00	1, 473. 16	26. 84	.....	26. 84
Chemical apparatus and supplies.....	2, 500. 00	2, 376. 81	123. 19	123. 19	.....
Miscellaneous.....	32, 000. 00	30, 863. 55	1, 136. 45	1, 120. 55	15. 90
Department of Steam Engineering, stores.....	800. 00	776. 23	23. 77	12. 63	11. 14
Department of Steam Engineering, material.....	1, 000. 00	950. 68	49. 32	29. 90	19. 42
Boat house.....	30, 000. 00	10, 529. 04	19, 471. 96	19, 470. 61	1. 35
Special course.....	5, 000. 00	3, 277. 30	1, 722. 70	274. 91	1, 447. 79
<b>Total.....</b>	<b>218, 813. 45</b>	<b>189, 488. 88</b>	<b>29, 324. 57</b>	<b>26, 442. 13</b>	<b>2, 882. 44</b>



*Report of Superintendent of Nautical Almanac.*

NAUTICAL ALMANAC OFFICE,  
BUREAU OF NAVIGATION, NAVY DEPARTMENT,  
Washington, September 30, 1889.

SIR: In compliance with the order of the Bureau I have the honor to submit the following report of the work of this office during the year:

## PRINTING.

The American Nautical Almanac for 1892 was issued from the press as usual in March, 1889.

The American Ephemeris for the year 1892 was issued in August, 1889. Of the Almanac and Ephemeris for 1893, 251 pages are now in type.

## DISTRIBUTION.

During the fiscal year ending June 30, 1889, the sale and distribution of the preceding publications were as follows:

Publications.	Sold.	Distributed
American Ephemeris .....	589	.....
American Nautical Almanac .....	2,126	.....
Atlantic Coaster's Nautical Almanac .....	974	.....
Pacific Coaster's Nautical Almanac .....	841	.....

A comparison with the report of sales for the preceding fiscal year shows, on the whole, but little change. The sales of the Ephemeris and of the American Nautical Almanac have slightly diminished, while those of the Coaster's Nautical Almanacs have increased.

The proceeds of sales, amounting to \$1,384.52, have, in compliance with law, been deposited in the Treasury to the credit of the appropriation for public printing and binding.

## COMPUTATIONS.

In accordance with the general system of work the computations of the Ephemeris for the year 1893 were nearly completed during the last fiscal year, while the printing is carried on during the present year. Two years are required for preparation of certain portions of the lunar ephemeris. The longitude and latitude of the sun and moon were therefore computed for the year 1894, a year in advance of the rest of the Ephemeris.

## NEW TABLES OF THE PLANETS.

The force which can be applied to this work is necessarily only such as can be spared from the regular routine duty of preparing the various annual publications. Hence, any deficiency in the force or any diversion of its activities is at the expense of the work in question. It thus happens that the occurrence of a number of vacancies during the fiscal year and the delay and difficulty in filling them, as well as the want of the usual naval assistance, have resulted in the work in question making less progress than was expected.

The most laborious part of the work is that of reducing the older observations with the more accurate data of modern times. The reduction

of Piazzzi's observations at Palermo, which I have mentioned in previous reports, has been substantially completed. Pond's Greenwich observations have been taken in hand more thoroughly than was intended, and the work of reducing them will probably not be completed until towards the close of the fiscal year. Progress has also been made in the comparison of observations with the tables, and in the formation of the equations of condition for the Sun and Mercury. It has also been necessary to make a thorough examination of much of the work with the view of discovering and correcting errors.

#### THEORY OF JUPITER AND SATURN.

During the fiscal year Mr. Hill has been occupied in comparing his provisional tables with observations in order to correct the elements. This work is still in progress.

#### TRANSITS OF VENUS, 1761-1769.

The observations of these transits have been among the most celebrated in the history of astronomy. About a half a century ago they were discussed with great thoroughness by Encke, leading to a determination of the solar parallax which was long the standard in astronomy, but which has since been found erroneous in a much larger degree than was expected. Since the discovery of this error a re-discussion of the whole set of observations has remained one of the desiderata of astronomy. The work of collecting and examining the observations was therefore commenced some years ago, and was completed and made ready for the printer during the last fiscal year. The resulting value of the solar parallax is  $8''.78$ , which is in close agreement with recent results derived in other ways.

Very respectfully, your obedient servant,

S. NEWCOMB,

*Superintendent Nautical Almanac.*

THE CHIEF OF THE BUREAU OF NAVIGATION.

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OFFICE OF THE LIBRARY AND WAR RECORDS,  
Navy Department, Washington, D. C., September 25, 1889.

SIR: I have the honor to transmit herewith the estimates for the Department Library and for the War Record Office for the coming fiscal year.

The usual increase of books has taken place during the past fiscal year, and the catalogue is now nearly ready for the press. The selection of books, in accordance with the principle established seven years ago, has been confined exclusively to such as are needed in the various branches of professional study and investigation. In order to keep abreast of naval development, it is necessary to devote a considerable part of the appropriation to the purchase of professional journals. Technical works, as is well known, are expensive, and an increase in the appropriation for the library to \$2,500, as allowed prior to 1885, is desirable.

The preparation of the war records for publication continues to make slow progress owing to the want of sufficient clerical force. A slight increase was made by Congress last year, which took effect at the begin-

ning of the current fiscal year. The force, however, is still far from being equal to the needs of the office. Estimates for an increase herewith submitted. The additional force needed includes one clerk class 4, to be employed in the preparation of statistical tables; 1 clerk of class 3, for the work of verification and classification; 1 clerk of class 2, for the examination of bureau and fleet records, navy yard records, log books, and official papers received from officers and their representatives. The work laid out for the above clerks requires absolute accuracy, without which the publication will be worthless, and it is impossible to retain in the lower grades of the clerical service men of the proper standing and ability. Four additional copyists are asked for at \$900 each. These are urgently needed for the active work of copying records. At present no copyists of this grade are allowed to the office.

One of the most serious needs of the office is that of an assistant messenger, for the want of which its work suffers delay and obstruction.

For the contingent expenses of the War Record office a moderate estimate of \$600 has been submitted. No provision is made at present for this purpose, and without that sum the work in the office cannot be carried out.

An appropriation of \$600 has been asked for necessary traveling expenses for the collection of records. In order to secure the Confederate records, it is indispensable that such an allowance should be made.

The importance of this work to the veterans of the war on both sides and the lively interest with which they, as well as the citizens generally of all sections of the country, regard it will, it is hoped, lead to its favorable consideration.

If the force estimated for is allowed at the coming session of Congress, the office will be able within a short time to begin the printing of its first volume.

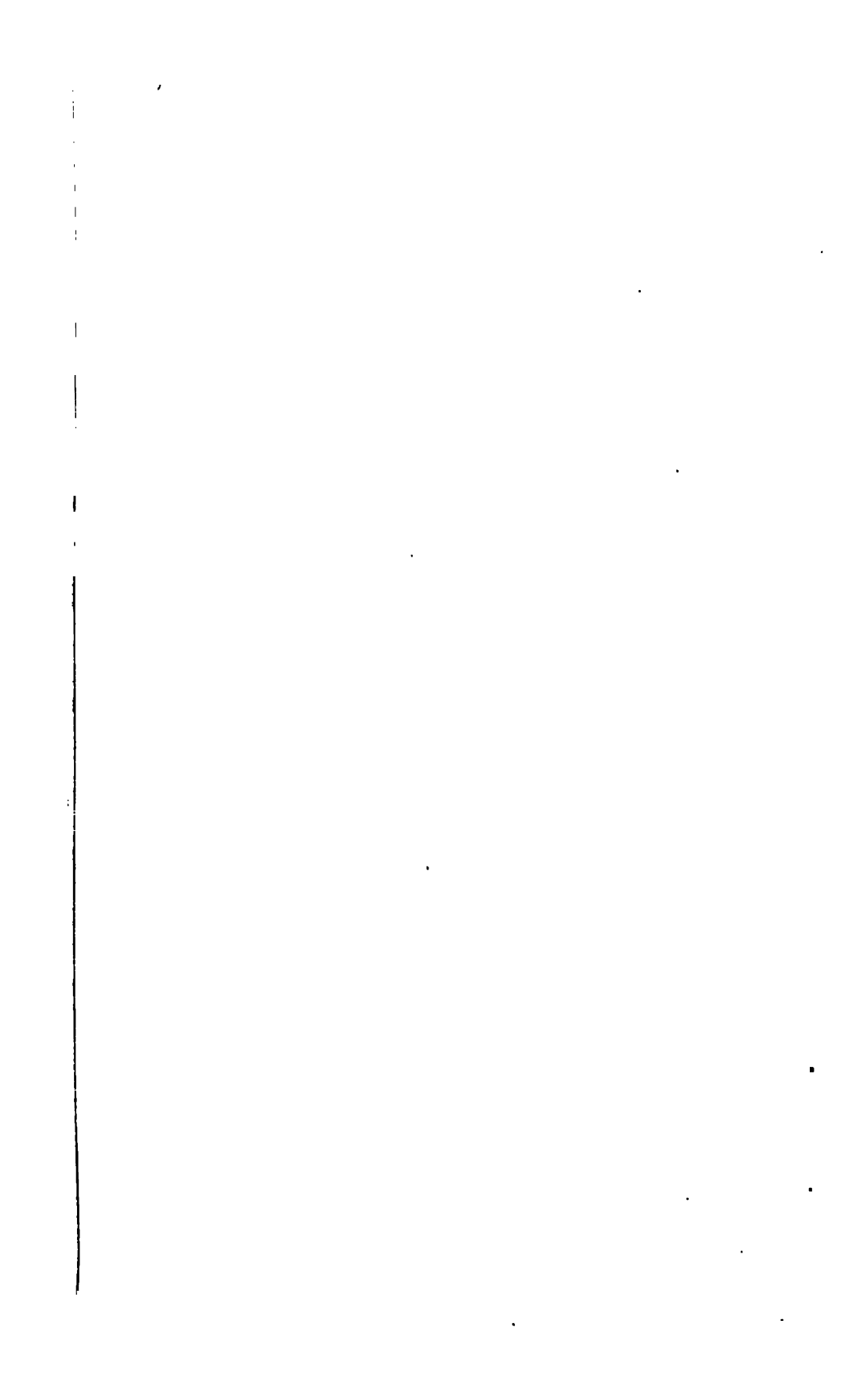
Very respectfully,

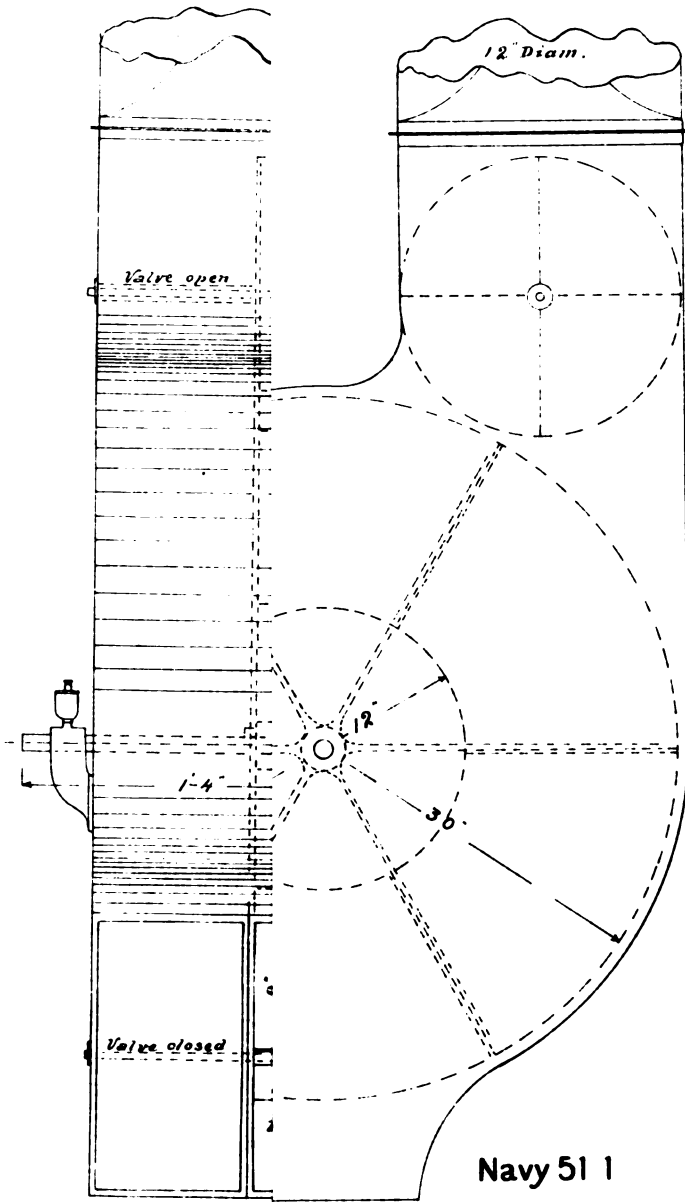
J. B. SOLEY,  
*Professor, in Charge*

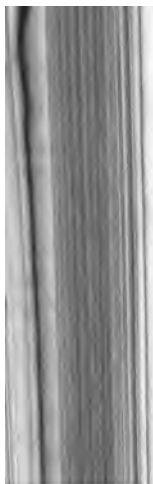
Commodore J. G. WALKER, U. S. Navy,  
*Chief of the Bureau of Navigation.*

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*REPORT OF THE HYDROGRAPHER TO THE BUREAU OF NAVIGATION.*

HYDROGRAPHIC OFFICE,  
BUREAU OF NAVIGATION, NAVY DEPARTMENT,  
*Washington, D. C., September 1, 1889.*

SIR: In the following report I have endeavored to give only an outline of the work performed during the past year, leaving the more detailed statements to the chiefs of divisions and officers in charge of the branch offices, whose accounts will repay examination. There are several matters of importance of which they do not speak to which I wish specially to call your attention.

Several plans have been carried into effect for the more economical distribution of the office force. By the construction of two large skylights in the roof and the addition of six windows in the north wall of the small building at the corner of Seventeenth street and New York avenue, it has been possible to put all the draughtsmen and engravers together, so that the employes attached to the Division of Chart Construction and the material (with the exception of the engraved plates) are all in one building. This is an immense gain in economy and efficiency.

The transfer of the draughtsmen from the Navy Department building has made it possible to consolidate the Division of Sailing Directions by putting all the force into two adjacent rooms, and this, in turn, has given a much-needed and contiguous space to the overcrowded Division of Marine Meteorology.

Through the courtesy of the superintendent of the State, War, and Navy Department building, Chief Engineer Thom Williamson, U. S. Navy, a small room under the portico of the main entrance, east front, was obtained as a mailing and storage room. This has enabled us to devote the space thus gained in the plate-room to the storage of type and the partial use of the three compositors who form the nucleus of the future printing-office. These changes, with the condemnation and sale of much useless material deposited in the store-room in the sub-basement, complete the general scheme of redistribution of force and material outlined long ago, and which the lack of means and opportunity has permitted but recently. For further development more means are necessary.

There have been established since the last report three new branch offices, namely, at Portland, Oregon, Norfolk, Va., and Savannah, Ga. These offices have stepped immediately into the favor of their respective communities, and have added considerably to the general efficiency of the whole branch-office service. As the appropriation did not admit of further expansion, in November I requested General Greely, Chief Signal Officer, U. S. Army, to direct the signal-service observers at Eastport and Portland, Me., to communicate with the branch hydrographic office at Boston; those at New London and New Haven with the New York branch office; those at Norfolk, Va., Wilmington, N. C., Charles-



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